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The Veterinary Journal.

OCTOBER, 1934.

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OCTOBER, 1934.

Biography

PROFESSOR WILLIAM CHRISTOPHER MILLER, M.R.C.V.S., F.R.S.E.

THE appointment of Mr. Wm. Miller as Professor in charge of the recently-endowed Courtauld Chair of Animal Husbandry in the Royal Veterinary College, will be received with gratification and pleasure by students and members of the profession alike.

Born in 1898, the son of a farmer living in the Eastern Counties, Mr. Miller commenced his professional career with the best of training to fit himself for the teaching and research posts which he has since occupied with such marked success. Always with an innate love of animals, he turned his thoughts to veterinary science, and in 1919 graduated from the Royal (Dick) Veterinary College in Edinburgh. His college career was a brilliant one, as he took away no less than eleven class prizes, with honours in several of the professional examinations. In 1920 Mr. Miller was appointed to the Lectureship in Zootechnics and Animal Management in the College; and in 1921 to the Lectureship of Veterinary Hygiene and Animal Management in the East of Scotland Agricultural College. Concurrently with these duties, he held external examinerships in Aberdeen University and the North of Scotland College of Agriculture, and at various times has been appointed as internal examiner within the University.

In 1928 he was appointed as a research assistant to take charge of the work on sheep and wool in the Animal Breeding Department, and later, when the institution was taken over by the University, as a senior member of the staff with the status of University Lecturer. During this period of office Mr. Miller also conducted the classes in Genetics and Livestock Breeding in the Royal (Dick) Veterinary College, and lectured to classes of medical post-graduates who were preparing for the Diploma in Public Health.

Notwithstanding his busy teaching life, he found time to undertake a special research on the wool of the sheep, and his work as an author has given the profession the two extremely popular text-books—"Practical Animal Husbandry" and "Black's Veterinary Dictionary." It is owing, too, to Mr. Miller that an Equine

Pregnancy Diagnosis Service has been established ; a service of which the racing and pedigree stockowner quickly recognised the importance, and which has already gained world-wide recognition as an aid to the clinical veterinary expert.

There is no need to write more except to add that this selection of Mr. Miller to be the first occupant of the recently-endowed " Courtauld " Chair of Animal Husbandry in the Royal Veterinary College will be as well received amongst our Continental *confrères* as amongst our colleagues in Great Britain.

Owing to the generous action of Mr. and Mrs. C. C. Courtauld, Professor Miller will enter completely new laboratories in which he can mould and build up a Department of Animal Husbandry worthy of being alongside the other Departments which are at last taking practical shape.

Editorial

THE SHEEP AS A VETERINARY PATIENT.

It needs no apology to those who know the importance of sheep as farm animals for having the desire to freshen the memory of our readers in regard to the healthy, as well as the diseased, conditions upon which the veterinarian has to pass his opinion. In some districts of Great Britain quite a lot of sheep practice is to be done ; and the preventive aspect against epidemics is important in all counties.

The eradication of sheep scab in particular is at the present moment the objective of an intensive campaign by the veterinary officials of the Ministry of Agriculture. During the last year 578 outbreaks of this disease were reported in Great Britain, an increase of 60 per cent. over the number in 1932. These occurred principally in the counties bordering the Pennine Range, *i.e.*, Cumberland, Durham, Derby, Notts, Lancashire, Westmorland and Yorkshire, and the steps recently taken by the Ministry's officials have already resulted in a satisfactory decrease in the number of outbreaks. When once this disease is eradicated, our insular position and the application of the quarantine laws will eventually add one more to the list of those whose absence from our midst is due to the application of veterinary scientific methods.

THE HUMANE SLAUGHTERING OF SHEEP.

In the earlier part of the year a Bill was passed through Parliament under which it is now illegal to slaughter an animal for food unless it is stunned to insensibility before the knife is used on its throat. This was made to apply to all animals slaughtered for human food—except the sheep. Why the sheep should be specially selected for omission is inexplicable on humane grounds, and can only be attributed to the mistaken opposition of certain interested parties. However, the fact remains ; and in so far as this animal is concerned, the Act is allowed to read " may " instead of " shall." *In Holland a law to this effect has been operative, in the case of all animals slaughtered for food, for some years.*

Quite a number of our large meat factories now use the electro-lethaler to cause the stunning before bleeding the carcase ; and in connection with this, we draw attention to the article in the present issue of The Veterinary Journal on the use of this method by its originator, our distinguished colleague, Professor Dr. Max Müller, the Chief Veterinary Inspector of the abattoir at Munich.

General Articles

PULPY KIDNEY DISEASE OF YOUNG LAMBS IN NORTH WALES.

Bacteria of Welch Group Isolated from Intestinal Contents.

By R. F. MONTGOMERIE, B.Sc., Ph.D., F.R.C.V.S., and W. T. ROWLANDS, M.R.C.V.S., D.V.S.M.

School of Agriculture, University College of North Wales, Bangor.

THE writers have already recorded[4] their demonstration of toxin of the type produced by *B. ovitoxicus* in the intestinal contents of 66 per cent. of the fifty-nine cases of pulpy kidney disease (P.K.) obtained in the 1932 and 1933 seasons. They had earlier observed[3] that the body tissues and fluids of lambs just dead of this disease were sterile, and in this paper present their work on the Welch-like bacteria present in the contents of the small intestine of some of their 1933 cases.

Bennetts[1] found *B. ovitoxicus* to be the only sporulating anaerobe present in the small intestine in seventeen of his eighteen cases of infectious enterotoxæmia. In the remaining case it was present in company with another undetermined sporulating anaerobe. He could not cultivate *B. ovitoxicus* from the small intestine of three normal sheep from affected pastures, nor could he demonstrate it in sheep dead or dying from a variety of other conditions. Investigating P.K. disease, Gill,[2] in New Zealand, isolated *B. ovitoxicus* from the contents of the small intestine of each of four cases, and Oxer,[6] working in Tasmania, isolated it from one case. These three workers concluded that the absorption of toxin produced during the proliferation of *B. ovitoxicus* in the contents of the gut is the immediate cause of the diseases they investigated.

Wilsdon[7] was able to show that members of the Welch group, as they occur in this country, are of four distinct types (A, B, C and D), differentiated chiefly by their toxin-antitoxin relationships. It is now generally accepted that his type D is, on the evidence available, identical with *B. ovitoxicus*.

The writers, using the method adopted by Bennetts, were able to demonstrate microscopically a varying but distinct preponderance of organisms morphologically resembling *B. welchii* in smears of the contents of the small intestine in all their P.K. cases of the 1933 series. In twenty-eight representative cases approximately 0.5 c.c. of the mixed contents of the small intestine was inoculated into a tube of freshly boiled and cooled horse-flesh meat medium. In each case heavy growth with much gas production was obtained, and from this " original " culture a 250 c.c. bottle of the same medium was heavily seeded. After three days incubation toxin could always be demonstrated in these " test " cultures. This toxin was regularly neutralised by serum prepared against *B. welchii* (Wilsdon

Type D), but in no case was it neutralised by *B. welchii* or *B. paludis* antisera. It was, therefore, concluded that *B. ovitoxicus* was present in the contents of the small intestine of each of these twenty-eight cases of P.K.

With a view to testing the purity, as to type, of the bacteria of the Welch group present in the intestinal contents of these cases, at least five isolations were made from each "original" culture. The technique employed was that described

THE TYPE OF THE WELCH-LIKE BACTERIA ISOLATED FROM THE CONTENTS OF THE SMALL INTESTINE OF ELEVEN CASES OF PULPY KIDNEY DISEASE.

Case No.	Interval between death and examination	Toxicity of intestinal contents filtrate*	Number of strains isolated	Number of strains non-toxic	Number of strains typed as *B. welchii*	Number of strains typed as *B. ovitoxicus*
3	Killed, *in extremis*, for immediate examination	0.2 c.c., 4½ hours	10	—	3	7
4	2 hours	0.1 c.c., 1 hour	10	—	—	10
5	16 hours	0.2 c.c., 1 hour	10	1	7	2
7	12 hours	0.2 c.c., ½ hour	7	—	5	2
9	12 hours	0.2 c.c., 1 hour	10	—	—	10
10	Killed, *in extremis*, examined 12 hours later	0.2 c.c., 1½ hours	3	—	—	3
11	2 hours	0.4 c.c., 3 hours	3	—	—	3
16	Killed, *in extremis*, examined 2 hours later	0.2 c.c., 4 hours	10	—	2	8
31	Chronic case, killed for immediate examination	Non-toxic	7	1	3	3
35	10 hours	0.2 c.c., 8 hours	4	—	—	4
38	4 hours	0.1 c.c., 2 hours	3	—	—	3
			77	2	20	55

* Intravenous injection into mice.—Dose and interval between inoculation and death.

in the writers' recent article on lamb dysentery[5] and the isolations were tentatively accepted as strains of the Welch group on their morphology, production of hæmolysis on blood agar plates and stormy fermentation of milk. Unfortunately, pressure of other work made it necessary to store the great majority of these isolations for some time. An unsuspected tendency to die out under the conditions of storage—horse-flesh meat medium in a cool, dark room—resulted in a serious loss of cultures before they were typed. (The writers' strains of the lamb dysentery bacillus remained viable for much longer periods under these conditions.) This loss greatly reduced the scope of this work, for only those cases in which

at least half of the isolations had survived were worthy of further study. It is particularly unfortunate that all ten isolations from each of two cases killed *in extremis* for immediate examination were lost. However, seventy-seven pure cultures from eleven cases (one a chronic case showing no demonstrable toxin) have been typed (*see* Table).

Each strain was grown in a freshly boiled and cooled 250 c.c. bottle of horse-flesh meat medium (Ph 7.5). Quantities of approximately 2 c.c. were withdrawn with sterile precautions after eighteen hours and after six days' incubation. The samples were centrifuged at 2,500 r.p.m. for half an hour, and the supernatant tested for toxicity by intravenous injection into mice. The test dose was 0.4 c.c. In two of the seventy-seven strains toxin was not detected on either occasion of sampling; in twenty toxin was detected at the eighteen-hour period only, and the remaining fifty-five were toxic on each occasion.

The seventy-five toxic strains were typed by observing the neutralisation of their toxin with certain standard antitoxins. With a view to overcoming the objection to the mouse intravenous method of determining the type of a toxin, a full dose of toxin was employed in this work. 0.5 c.c. of the toxin was mixed with an equal volume of each antitoxin, the mixture incubated at 37° C. for half an hour, and 0.8 c.c. of it very slowly intravenously injected into mice which were kept under observation for three days. The Wellcome Physiological Research Laboratories favoured the writers with an ample supply of the following standard antisera used in these observations: (1) "*B. welchii* serum" G.G.C. 2784 and C3305A; (2) "*B. paludis* antiserum"; (3) "*B. welchii* serum, anti-Wilsdon type D." The toxin of each of the twenty strains which produced detectable toxin at the eighteen-hour period of sampling only was completely neutralised by each of these antisera. These, therefore, were accepted as strains of classical *B. welchii* (Wilsdon, type A). The toxins of the remaining fifty-five, detected at the eighteen-hour and six-day periods of sampling, were neutralised only by *B. welchii* serum, anti-Wilsdon type D," and these isolations were therefore accepted as strains of *B. ovitoxicus*. The detail submitted in the accompanying table shows that in six of the eleven cases all the isolations were accepted as strains of *B. ovitoxicus*, and that in each of two of these cases ten strains were examined. This would suggest that the "original" culture contained no organisms of the Welch group other than *B. ovitoxicus*. In several cases the interval between death and examination was considerable. In Case No. 3, however, the examination was commenced immediately after slaughter, and only seven of the ten strains isolated were of the ovitoxicus type. It would, therefore, appear that the bacterial flora of the small intestine in respect of Welch-like organisms may, at the moment of death, be mixed. The possibility of invasion during illness cannot, however, be overlooked. This lamb had shown severe symptoms for one hour prior to slaughter. In Case No. 31, the lamb had been ill for two days before it was killed for examination, and although no intestinal toxin was demonstrable, *B. ovitoxicus* was isolated in company with other Welch-like organisms.

XUM

As a control to these observations the types of the Welch-like organisms present in the contents of the small intestine of the normal lamb used as a control in the tests for intestinal toxin[4] were studied. The original culture was of mixed contents taken six hours after death by chloroform inhalation. Ten strains of organisms belonging to the Welch group were isolated. Each produced detectable toxin at the eighteen-hour period of sampling only, and this toxin was completely neutralised by all the standard antisera. These, therefore, were accepted as strains of classical *B. welchii*.

The toxin-producing capacity of four of the above strains of *B. ovitoxicus* was further studied. Incubated for eighteen hours, the M.L.D. (intravenous injection into mice) of the cultures of these strains lay between 0.2 c.c. and 0.05 c.c. At forty-two hours the cultures were distinctly more toxic—M.L.D. between 0.05 c.c. and 0.02 c.c., and thereafter a gradual rise in toxicity brought the M.L.D. to between 0.02 and 0.01 on the fourth day and 0.01 to 0.005 on the seventh day. It remained at approximately this level even after twenty-five days' incubation. This stability of its toxin is a notable feature of *B. ovitoxicus*.

Antiserum was produced from each of these four strains by the hyper-immunisation of four sheep, anaculture of a three-day-old culture being employed for this purpose. These antisera completely neutralised the toxin produced by each of the above strains; by *B. ovitoxicus* (strain M.R. received from Bennetts and strain P.K.8 received from Oxer) and by *B. welchii*, Wilsdon, type D (strain 21 received from Dalling) after two, four and six days' incubation. They also neutralised the toxin produced by a freshly isolated strain of the lamb dysentery bacillus when the period of incubation was eight days and ten days, and that produced by *B. welchii* (twenty-four hours' incubation). They failed to neutralise the toxin produced by *B. paludis* (eighteen hours' incubation), and by the lamb dysentery bacillus when the period of incubation was eighteen hours and two days. These antitoxins, therefore, behaved as does the antitoxin of *B. ovitoxicus*, and this confirms the identification of these strains.

Conclusions.

Despite the unfortunate loss of certain material, this work appears to be of sufficient range to justify the following contentions:

(1) *B. ovitoxicus* (*B. welchii*, Wilsdon, type D) can be regularly isolated from the contents of the small intestine of cases of pulpy kidney disease of young lambs in North Wales.

(2) *B. ovitoxicus* apparently may be the only member of the Welch group present therein, or it may occur in association with classical *B. welchii* (*B. welchii*, Wilsdon, type A).

(3) These findings, in conjunction with the writers' demonstration of an intestinal toxin of the *B. ovitoxicus* type, determine pulpy kidney disease of young lambs in North Wales as an infectious enterotoxæmia due to the proliferation of and toxin production by *B. ovitoxicus* (*B. welchii*, Wilsdon, type D) in the contents of the small intestine.

REFERENCES.

[1] Bennetts, H. W. (1932): Council for Scientific and Industrial Research, *Bulletin* 57.

[2] Gill, D. A. (1933): "Report on Pulpy Kidney Disease of Lambs." (Privately circulated).

[3] Montgomerie, R. F., and Rowlands, W. T. (1931): THE VETERINARY JOURNAL, lxxxvii, pp. 401–410.

[4] Montgomerie, R. F., and Rowlands, W. T. (1933): THE VETERINARY JOURNAL, lxxxix, pp. 388–398.

[5] Montgomerie, R. F., and Rowlands, W. T. (1934): THE VETERINARY JOURNAL, xc, pp. 323–337.

[6] Oxer, D. T. (1932): Council of Industrial and Scientific Research, *Pamphlet* 35.

[7] Wilsdon, A. J. (1931): University of Cambridge Inst. of Animal Path., *Second Report*, pp. 53–85.

A NOTE ON THE DEVELOPMENT OF FASCIOLA HEPATICA AND AN OUTBREAK OF ACUTE LIVER ROT.

By W. LYLE STEWART, M.R.C.V.S.

Armstrong College, Newcastle-upon-Tyne.

NEARLY a hundred years ago William Youatt, a distinguished veterinarian, published an informative book on sheep which dealt at length with the various breeds, their management and diseases. Liver rot, a disease of great antiquity, was well known as a universal scourge of sheep, yet it seems strange to reflect that only a century ago the acutest controversy ranged around its cause, and many curious opinions were held. Even the advanced Youatt expressed the view that the flukes found in the livers of "rotten" sheep, were the result and not the cause of "rot," adding picturesquely that the liver flukes "resemble the birds of prey that hasten the death and demolition of the fallen deer, but who were not concerned in bringing the animal down." Linnæus classified and named *Fasciola hepatica in* 1758, but nearly if not more than one hundred years elapsed before this parasite became generally recognised as the actual cause of liver rot. The life-history of *Fasciola* was originally worked out by Leuckart and Thomas, the latter of whom published an account of his researches in the Journal of the Royal Agricultural Society in 1881.

This newer knowledge was duly incorporated in veterinary textbooks, and, for example, the development of *Fasciola* is clearly set forth in "Neumann's Parasites," published in 1892. But still one link in the chain was missing. This author stated that when the encysted cercariæ arrived in the stomach, the cysts were dissolved, setting free the parasites, which then penetrated to the liver, "probably by the ductus choledochus." The vibratile tail of the cercaria was no doubt assumed sufficient to propel the parasite against the flow of bile and through the gall-bladder.

According to Baylis ("Manual of Helminthology," 1929), Ssinitzin found that in the case of Fasciola the young flukes leave the alimentary canal immediately after the dissolution of their cysts by burrowing through its walls, and migrate

to the peritoneal cavity, where they can be found from the fourth to the fourteenth day. During their subsequent wanderings in the abdominal cavity, the cercariæ feed periodically by attaching themselves to the viscera, until on reaching the liver they enter this organ by burrowing through its capsule from the outside, and not, as formerly supposed, by creeping up the bile-ducts from the lumen of the intestine.

This gradual unravelling of the complicated history of the *Fasciola hepatica*, together with the remarkable success which has attended modern methods for controlling the disease which it causes, forms a good illustration of the value of scientific inquiry applied to the everyday needs of the sheep industry. It may be that we have not yet reached a complete understanding of this parasite's ecology, but it is at least encouraging when one meets with practical evidence tending to confirm the accepted theory.

Early in November a few years ago I was called in consultation regarding sudden deaths among a flock of semi-fat sheep. The sudden onset of disease and the absence of premonitory symptoms, together with the appearance of the carcases after death, suggested anthrax; but anthrax was excluded by the veterinary inspector prior to my visit. I was informed that from a flock of about one hundred young sheep, eight had died suddenly. The remaining sheep were in excellent fat condition. A post-mortem examination was conducted upon a young ewe which had been found dead that morning.

Post-mortem.—The carcase was distended with gas, and thickened dark blood soiled the anus. Blood-stained froth was being expelled from the nostrils. Examination for anthrax proved negative. The ewe, prior to death, had been in excellent condition, and large deposits of fat hung around the kidneys, omentum and mesentery. A most striking feature was presented by the intestines, which were discoloured, tense and turgid from the duodenum to the cæcum. All the other organs, with the exception of the liver, appeared to be normal. The small intestines were full of liquid ingesta mixed with dark-purplish blood in a semi-clotted state. The hæmorrhage proved to be proceeding from the liver *via* the bile-duct, and the gall-bladder was full of venous-looking blood in an unclotted condition.

The liver was swollen and congested, and a number of immature flukes about one-quarter of an inch long were detected in the liver substance. It was now sufficiently clear that I was dealing with a text-book case of acute liver rot. In my opinion the actual cause of death was hæmorrhage into the small intestine following extensive damage to the vascular system of the liver caused by migrating cercariæ.

A closer inspection of the surface of the liver now revealed an interesting picture. The capsule was everywhere studded with darker areas, measuring about three millimetres across, which showed up clearly against the less intensely inflamed background. These areas were clearly the points of entry of the cercariæ, and the multiple wounds thereby produced in the liver were doubtless responsible

for the fatal hæmorrhage. In the liver there is a confluence of the arterial and portal blood supplies which occurs within the lobules, and from thence the blood has two possible exits. The normal channel is through the central vein of the lobule to join the hepatic trunk, but there is also an exit through the bile canaliculi to join the bile duct. Presumably the venous exit was insufficient to cope with the hæmorrhage resulting from the damaged parenchyma, and the blood had been forced into the alternative channels.

Unfortunately, I cannot recall the exact history of the previous movements of these sheep. So far as I remember, they had returned to the home pastures in October. These pastures had previously been stocked with sheep, and it was presumed were heavily loaded with encysted cercariæ. As a result of many cercariæ migrating at or about the same time, the liver was extensively damaged by multiple punctures almost simultaneously produced. Judging from the literature on the subject, acute liver rot may be considered an unusual if not a rare occurrence.

I am indebted to Dr. J. N. Oldham, Imperial Bureau of Agricultural Parasitology, St. Albans, Herts, for the following references:

Thomas, A. P. W. (1881): "Report of Experiments of the Development of the Liver Fluke (*Fasciola hepatica*)." *J. Roy. Agric. Soc.*, Eng., Lond., (2 ser.) xvii (1), 1–30.

Thomas, A. P. W. (1883): "The Life-history of the Liver Fluke, *Fasciola hepatica*." *Quart. J. Micr. Sci.*, xxiii (N.S. lxxxix), 99–133, pls. 2–3, figs. 1–26.

Ssinitzin, D. (1914): "Neue Tatsachen über die Biologie der (*Fasciola hepatica* L.) Vorläufige Mitteilung." Zbl. Bakt., Abt. 1, Orig., lxxiv (3/4), 280–285, 3 figs., June 13th.

Ssinitzin, D. (1915): "Liver Fluke (*Fasciola hepatica* L.) in the Moscow District." *Repts. Zemstvo Moscow District*, No. 14, pp. 42 (in Russian).

CHRONIC COPPER POISONING IN SHEEP.

By NORMAN BISSET, M.R.C.V.S.

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JUDGING from the scanty references available, the subject of chronic copper poisoning in animals appears to be of a somewhat debatable character. According to Lander,* "chronic copper poisoning is stated to occur amongst animals in the neighbourhood of smelting works. . . . It is doubtful whether the disorder is not due to arsenic."

This statement is practically a quotation from Nunn,* but Lander adds the following remark: "Analyses of the livers of animals supposed to have died from this cause have been made, and failed to reveal a larger proportion of copper than that normally found." Neither author gives his authorities for the above statements, although Nunn gives the locality of the smelting works as Wales. Lander mentions Wales in connection with chronic arsenical poisoning. Both authors agree as to the tolerance of the animal body for copper, Lander stating definitely that it is normally present in the livers of domestic animals. The only

* "Veterinary Toxicology"

instance given, however, is the dog, where the proportion is said to be 1 in 40,000. No mention is made of the proportion normally present in the livers of other animals. Nunn goes so far as to cite, as proof of this tolerance, the analysis of Raoult and Breton, who found six milligrammes of copper in 400 grammes of liver, referred to as a " comparatively large quantity." Lander finally concludes that " detection of copper in the liver and kidneys is no evidence of copper poisoning. . . ."

In view of the above statements, the following notes of a case which is still under investigation may be interesting:

For the past two years periodic losses among sheep had occurred on a farm in South Wales. The farm was situated in an industrial area about a mile from a nickel smelting works from which the prevailing winds laid a pall of fumes on the fields, sometimes for a week or more at a time. The animals affected were all over a year old, the general symptoms being the more or less usual ones of progressive depression, dullness, emaciation and weakness. Death was preceded in every case by hæmaturia.

On post-mortem examination the liver was found to be enlarged and degenerate, the colour varying from a brownish-yellow to a startling sulphur or orange. The kidneys were enlarged, inflamed, and much congested in the younger animals. In the older cases they were completely broken down into masses of bloody pulp. Sub-epicardial hæmorrhages were present. There was gastro-intestinal catarrh, the mucous membrane of the small intestine being considerably thickened. The intestinal contents were soft, but not fluid, and were intensely black in colour. Chronic poisoning, probably metallic and perhaps arsenical, was suspected, and analyses were made of the livers of a three years old and a fifteen months old victim. In 100 grammes of liver in the former animal 59 milligrammes of copper were found, or nearly forty times the " comparatively large " quantity mentioned by Nunn. The proportion of copper found in the younger animal was 25 milligrammes.

Special analyses were made for arsenic, lead, nickel, cadmium and zinc. No arsenic was found, although three separate tests were made, two by Reinsch's method, as recommended by Lander, and one by the Marsh test. Tests for lead nickel and cadmium were also negative, but a trace of zinc was found in the older sheep. Copper was found on analysis in nine samples of herbage from various fields on which the sheep had been pastured, and also in samples of oat, wheat and swede leaves. Nickel, however, was also found in these samples, but, as has been mentioned, it was not demonstrable in the livers.

It must be emphasised that the case is still under investigation, and that the possibility of arsenic being at least a contributory factor has not been lost sight of. Apart from the coloration of the liver, however, the post-mortem appearances were not typical of those of chronic arsenical poisoning. Further analyses are in progress (using various methods for the destruction of the organic material), and analyses of surface soil are also proceeding.

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It is noteworthy that the mortality commenced about the beginning of the severe droughts. The grass on the fields in question had scarcely any hold on the soil, attempts to pluck it resulting in uprooting the entire plants. The sheep, being forced to graze even more closely than usual, could hardly avoid ingesting a quantity of soil with every mouthful. It may be mentioned that at no time had the animals been dosed with any preparation of copper.

Thanks are due to Professor Fagan, Aberystwyth, and Mr. P. V. Lloyd, F.I.C., for analyses of herbage and hepatic samples respectively.

CASEOUS LYMPHADENITIS; PSEUDO-TUBERCULOSIS OF SHEEP; CHEESY BRONCHO-PNEUMONIA.

By Lt.-Col. T. DUNLOP YOUNG, O.B.E., D.V.S.M., M.R.C.V.S., F.R.San.I.

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DURING the last few years this disease has engaged the attention of meat inspectors in exporting and importing countries, due, no doubt, to the greater care being taken to ensure freedom from disease of all imported meats.

The writer first observed the disease in 1901 in the organs of imported sheep in the Foreign Cattle Market, Deptford. At that time few meat inspectors were employed in Britain, and the staff in the market being small, only obviously affected carcases were dealt with ; in other words, no systematic examination of every carcase and its lymph glands took place. Lesions were submitted to Sir J. MacFadyean, who kindly confirmed the diagnosis. The lesions were observed in various organs and in the principal body lymph glands ; decision as to the fitness for food of affected carcases was made similar to that arrived at when dealing with bovine tuberculosis.

Importation of animals to Deptford Market gradually ceased, and thus interest in the disease temporarily passed. On taking up duty in the City, I had from time to time submitted to me by the inspectors, carcases of sheep in which lesions of the disease had been found ; this stimulated further interest in the lesions as to their situations and appearance. In 1913, while in Argentina, opportunity occurred to study the disease ante-mortem and post-mortem, which proved of much value in later years. Practically no attention was given to fresh problems in meat inspection during the period of the Great War, but in 1919 attention was again turned to the disease, and, due to the cutting-up of carcases in the markets having increased, greater opportunity was given to find lesions in the body lymph glands.

The number of carcases found affected in consignments from one country was so great that it became necessary to examine 100 per cent. of a full cargo,

and the result was such that percentage tests were made of consignments from other countries, resulting in a recommendation being issued by the Ministry of Health that all imported mutton should receive special examination. During this examination wonder was expressed as to how lesions in the carcase lymph glands had escaped detection at the places of slaughter.

While visiting frigorificos in various countries, I observed that examination of body lymph glands was confined to palpation; consideration was given to this, with the results that it was found almost impossible to detect lesions in lymph glands if the lesion contained pus, because the pus being soft and contained in the warm, soft, yielding surrounding tissue, there was no resistance to the palpation, therefore they escaped detection. Yet the same lesions were easily observed in the frozen carcase when it was being dismembered. It was only the firm, dried onion-like structure chronic lesions which, being caseous, were detected by palpation. It was then resolved that incision of the principal body lymph glands—*viz.*, superficial inguinal, supra-mammary, precrural and prescapular—be made. This work, necessitating additional inspectors, was at once put into operation with such eminently successful results that, instead of being necessary to examine 100 per cent., only 5 per cent. is now inspected as a check on the efficiency of the work done at the places of slaughter.

The inspection is generally very good, taking into consideration the large number of animals killed daily; in some works up to 10,000 sheep being slaughtered per day. Such numbers no doubt explain why occasionally a small percentage of imported carcases are found to contain lesions. The disease is said to be unknown in sheep in Great Britain; this is doubtful, but it must be very rare as it is never reported amongst the list of the diseases found in our public abattoirs. To those who have not studied the disease, the following brief notes may prove useful, especially to those who have to inspect imported carcases.

Cause.—The Preisz Nocard bacillus, a very fine rod, non-sporulating, and easily stained with aqueous aniline dyes; Gram positive; culturally oval, club-shaped and pear-shaped forms are observed.

Symptoms.—May be *nil.* Generally the sheep remains in good health, and on slaughter may be found very fat. When sheep are being shorn abscesses may be found in the superficial body gland regions; contents of the abscess being a glutinous, greeny pus.

Mode of Infection.—The bacilli are contained in the soil, and gain entrance to the body through wounds and abrasions, *e.g.*, after tailing, castration, ear marking and cuts when shearing. Some interesting experimental work has been done in Australia and New Zealand on this subject. Animals have been successfully inoculated with infected soil. This shows the necessity of more hygienic methods in carrying out the above-mentioned operations.

Anatomical Observations.—Lesions in the form of abscesses are generally surrounded by a thick fibrous capsule; the contents are of a glutinous, greenish

colour, but in the chronic stage may be greyish-white and caseous in consistency, never calcareous, and the lymph gland, being completely disorganised, consists of an onion-like (concentric layers) structure of caseous material, or several small concentric layered centres may be observed in a gland with parts of the gland apparently almost normal. Every organ of the body may contain lesions, but mesenteric glands are rarely affected. The principal body lymph glands to be examined have already been mentioned.

Percentage of Diseased Animals.—This varies from *nil* in young lambs to 70 per cent. in old sheep, and depends in a great measure on the region from which the animals are derived.

Judgment.—In Memo 62 (Foods), issued by the Ministry of Health as a guide to meat inspectors, it is advised that when evidence of the disease is observed the carcase should be destroyed. This is contrary to the opinion held in other countries, where those responsible for the inspection hold an opinion that the decision as to fitness for human food could be based on the same conclusions as for tuberculosis.

TREMBLING AND LOUPING-ILL.

By J. CUILLÉ and P. CHELLE.

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TREMBLING is a malady peculiar to the ovine race, which is prevalent in France in certain well-defined regions, and especially among the milch sheep of Tarn and Aveyron. Under the name of "louping-ill" the English designate a similar affection confined to the sheep, which is observed in the North of England, Scotland and Ireland. Both affections are characterised by nervous manifestations. Almost all French authors consider them as identical: the term louping-ill in our literature has become synonymous with trembling. It is Cadéac who, in his treatise on internal pathology, seems to have been the first to assimilate the affections, and he is followed by Moussu in his "sheep maladies," and Liegeois in his "Medical Pathology of the Domestic Animals." Lépine adopts the same synonym; he experiments with the virus of louping-ill, and calls trembling an ailment brought about by this virus. In a recent journal of popular science, an article signed with the initials C.C. (those of an old professor at one of our schools), the author attributes the ætiology of louping-ill to trembling. Is this homology justifiable?

We propose to examine the question rapidly. The question is not only interesting from the speculative point of view, it has a certain practical interest. Numerous and methodical researches made in recent years on louping-ill have pretty completely cleared up the ætiology of the malady and allowed of planning prophylactic measures. If louping-ill is truly, as French authors assert, identical

with trembling, we ought to undertake a rational prophylaxis against this dangerous malady.

Is louping-ill identical with trembling? A comparative study of the symptoms and ætiology of these two affections should furnish the answer to this question. A superficial glance at the evolution of these two maladies indicates already very clear differences: trembling is a *chronic apyretic malady* with markedly slow evolution (two to six months, or perhaps longer in certain cases); louping-ill, on the other hand, is an *acute febrile malady* (105° to 107° F.), with rapid evolution (a few days, sometimes even a few hours). Moreover, while all affected subjects of trembling succumb (only Stockman has observed a few cases of recovery), it is not uncommon for animals affected with louping-ill to recover; in the benign form the mortality may not exceed 10 to 20 per cent.

If we examine more closely the detail of symptoms, the difference is further accentuated. Trembling is essentially characterised by three principal symptoms: general hyperexcitability, cutaneous hyperæsthesia, and locomotor disturbances. The first sign of the ailment is an exacerbation of general sensibility: the ailing subjects become excitable at the approach of anybody; of a dog, the least touch produces a tremor, or even an actual intense and prolonged trembling; this is one reason that the name trembling has been given to this malady.

Cutaneous sensibility is likewise increased; it is accompanied by an intense pruritus, which induces the animal to bite and scratch itself against surrounding objects. Under the influence of bites and friction the wool becomes ruffled, finally it tears off, giving to the subjects a characteristic aspect; these signs of itching are, above all, manifest in the lumbar region (prurigo lombaire).

Locomotor disturbances commence in the posterior limbs: they are shown at first by weakness, then by inco-ordination of movements; the gait is uncertain and hesitant, the limbs are rigid, and the animal stumbles at each instant. If urged to run, inco-ordination of movements is accentuated, the animal gallops behind and trots in front, finally the posterior parts, not being able to follow the anterior, the animal moves by successive little bounds or leaps, hence the name trotting or leaping illness. The trouble advances until anterior movement becomes impossible, the subject remains stretched out on the litter and eventually dies. A fact worthy of notice is that the appetite persists to the end, and besides, during the evolution of the malady, the invalids can be heard to grind their teeth. None of these symptoms is met with in louping-ill; one neither observes general hyperexcitability, nor cutaneous hyperæsthesia, nor any of the diverse locomotor disturbances so characteristic of trembling. The subjects are at first dull and downcast, they have no appetite, often they press against the wall or present rotatory movements analogous to those observed in gid. Soon they are unable to get up and stand; they remain stretched on the ground, the limbs and head agitated with convulsive jerkings, hence the name "trembling disease" given to this malady. Often the head is stiffly carried back against the vertebral column; in opisthotonos it is a characteristic attitude. The sick animals die very quickly.

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The lesions found at the autopsy are very different in each ailment. In trembling they are non-specific; histological examination of the nervous centres has been constantly negative; only Besnoit and Morel have determined lesions of peripheric neuritis, which have never been met with again. In louping-ill, on the other hand, Brownlee and Wilson and, more recently, Lépine have constantly encountered characteristic lesions of encephalitis and myelitis. The study of the symptoms and of the lesions shows very clear differences between the two maladies, which are further accentuated and confirmed by a study of the epidemiology and ætiology of the two affections.

Trembling appears in a rather sporadic form. It happens that several subjects in the same flock are affected, but they are ordinarily at some intervals apart; the total annual percentage of sick is relatively small—10 to 15 per cent. The cases increase gradually throughout the year without there being a period of severity or great intensity in the malady.

Different experimental transmission tests made by Besnoit and Morel (inoculation of blood subcutaneously or intravenously, inoculations by different channels of organ pulp) have always failed. As might be expected from the nature of this malady, these facts show that trembling is an affection which as yet has not been possible to transmit by inoculation. Louping-ill, on the contrary, appears as a plain enzootic; in some years an important part of the effectives—twenty, thirty, and even fifty per cent.—are attacked; the malady disappears afterwards, and it is rare that it reappears again in the same flock; it seems that the first attack confers immunity. Moreover, louping-ill shows itself at a certain epoch of the year—April and June.

Finally, past experiences, confirmed by those of Alston, Gibson, Pool, Brownlee, and Wilson, have shown that it is inoculable by different routes, not only in sheep, but also in other animals, notably the pig and mouse. Later experiences have also shown that the agent may be a filtrable virus transmitted by ticks, which explains certain ætiological conditions, particularly the appearance of the malady in spring. Besides, trembling exists in England, and is clearly distinguished from louping-ill and known under the name of "scrapic trotting disease," or "trembles."

In France louping-ill is also met with: it was described first by Cauvet, in 1854, then by Leblanc and Savigné, in 1897; and by different authors it is designated, improperly, by the name of enzootic cerebro-spinal meningitis; certain people have classed it wrongly as a convulsive form of trembling. It presents numerous analogies with the malady R. Moussu has described under the name of contagious neurosis of sheep. The confusion produced in France can be explained by an error of translation. The English still call louping-ill "trembling disease," indicating by this one of the characteristic symptoms of the malady—the convulsive movements of the head and limbs. The French have translated this as "trembling." Louping-ill and trembling appear to us, therefore, by their clinical manifestations and by their ætiology as two very clearly distinct

maladies. We ought to recognise among the nervous affections of sheep, on the one hand (scrapie, trotting disease, trembles) a sporadic malady, non-inoculable, with a chronic evolution, apyretic, essentially characterised by the triad symptoms general hyperexcitability, cutaneous hyperæsthesia, motor inco-ordination, and by the absence of appreciable lesions of the nerve centres ; on the other hand, louping-ill, an enzootic malady, contagious and inoculable, characterised from the clinical point of view by convulsive movements of the head and limbs and from the anatomo-pathological point of view by lesions of encephalo-myelitis.

—*Revue Vétérinaire et J. Med. Vét.*
Dec. 1933.

THE SPASMS OF ANIMALS STUNNED ELECTRICALLY AS A SIGN OF UNCONSCIOUSNESS.

By Professor Dr. MAX MÜLLER,

Professor of Meat Inspection in the University of Münich, and Chief Veterinary Inspector to the Abattoir.

In The Veterinary Journal, Vol. 90, page 232, J. Roos and S. Koopman published studies of the so-called electrical stunning of animals, and expressed the opinion that the picture of animals subjected to the current used was characterised by symptoms of excitation of the central nerve system only. Signs of stunning had not been observed, but it was possible that consciousness could be influenced in an opposite way.

From the point of view of physiological facts and of the experiments made, however, it did not appear to be credible that there was an unconsciousness present. This opinion is erroneous, nor is it correct that there is no point of correspondence between electrical stunning and the chemical one. It is precisely the production of unconsciousness that the correspondence between the effect of the electric current and the chemical narcotics consists in.

In the *Deutsche Schlachthof-Zeitung*, 1931, No. 21, I have published a treatise on " Consciousness and Unconsciousness of Cattle Bleeding to Death," expounding therein minutely the phenomena manifesting the state of unconsciousness with electrically-stunned animals. These statements have escaped the notice of Roos and Koopman in their studies of the literature. In a like manner they have overlooked my explanations concerning " the spasms of electrically-stunned cattle in the light of biological research " in the *Deutsche Schlachthof-Zeitung*, 1932, No. 1. I have stated therein the physiolgical facts, from which it follows that though the spasms of electrically-stunned animals are a sign of excitation of the central nerve system, *they are yet at the same time a sign of the unconsciousness of electrically-stunned animals which is connected with it.* For the application of electric stunning leads to spasms, the latter to cerebral anæmia, and the cerebral anæmia or the impediment of the blood circulation in the brain respectively leads at the same time to unconsciousness.

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The fundamental physiological researches on this subject were made by Kussmaul and Tenner in the year 1857 (*see* " Untersuchungen zur Naturlehre des Menschen und der Tiere," vol. iii, 1857). Even before that Tavers, Marshall Hall, and Astley Cooper (1836) had found that spasms occur with cerebral anæmia. Kussmaul and Tenner showed that by tying up the arterial flow of blood to the brain of animals an unconsciousness accompanied by spasms is produced. This was also the first fundamental explanation of how the epileptic fit originated with human beings.

I have also explained in the *Deutsche Schlachthof-Zeitung*, 1929, No. 5, page 88, in my article " On the Nature of Electrical Stunning," that electrical stunning may be compared with an epileptic fit produced artificially ; that by means of weak current we produce an epileptiform condition which is accompanied by unconsciousness and insensibility. These are facts one must know if one wants to express an opinion on the manner of action of the method of stunning cattle by electricity.

By his explanations, Professor Roos perhaps intends to assist his co-religionists in the question of killing according to the Jewish rite. In any case, the experiments of Kussmaul and Tenner are fundamental for the explanation of the unconsciousness produced with cattle by electrical methods. As the electric momentary stunning cuts off or impedes respectively the flow of blood to the brain in a bloodless manner, this process is consequently based on physiological verifications dating far back. Their knowledge manifests clearly the nature and mechanics of electric stunning.

Kussmaul and Tenner established that with animals an arterial anæmia of the brain setting in suddenly and acutely leads to coma and spasmodic fits. With the animals they experimented on they tied up or compressed the four arterial vessels leading to the brain. When the arterial flow commenced again the fits and unconsciousness disappeared. Consequently these experiments on animals, on the one hand, resulted in unconsciousness accompanied by spasms in the same way as with cattle stunned by electric method. On the other hand, it was shown that consciousness is preserved as long as the brain is supplied with arterial blood.

The fits of the animals always resulted in conditions of coma, *i.e.*, complete unconsciousness, insensibility and spasms. The latter were tonic in the beginning, afterwards clonic. They were particularly characterised by severe bending and stretching spasms of the extremities. Then there followed a gradual diminution of the spasmodic phenomena—the same phenomena as with cattle rendered unconscious by electric methods. Also by electrifying the cervical sympathetic, Kussmaul and Tenner obtained on the side of the non-ligated carotid a general spasmodic condition and coma. Thus by the causal investigations by Kussmaul and Tenner with animals the experimental proof has already been furnished that with electric stunning the spasmodic condition setting in is accompanied by unconsciousness and insensibility on account of an impeded blood circulation

in the cerebrum. The authors emphasise that the unconsciousness and insensibility of the animals are due to derangements of certain parts of the hemispheres of the cerebrum. They assert that arterial anæmia setting in quickly affects on the one side the cerebral cortex as the organ of consciousness, whilst the anæmia of the pons and of the medulla oblongata, on the other hand, causes spasms to appear.

Applying, therefore, these results, stated by Kussmaul and Tenner, to the method of stunning cattle by electricity, we see that by conducting the electric current through the medulla oblongata and through the cerebrum, anæmia is produced in the brain and that thereby phenomena are produced in a bloodless manner such as Kussmaul and Tenner have already established by their experiments on animals; complete unconsciousness and insensibility (coma) with tonic-clonic spasmodic conditions appear simultaneously. When the supply of current ceases the coma still continues for a while, and then consciousness and perceptivity gradually set in again, unless the animals are bled to death whilst comatose. Thus the explanation which I have given independently from those very remote statements is correct, that is, the electric irritating action on the brain such as we produce with cattle by momentary stunning leads to epileptiform spasms.

The assertion that the electrically-stunned animals are conscious at a stage of excitation, that they are not stunned, is thus inconsistent with the physiological facts proved experimentally, apart from the obvious state of complete unconsciousness.

How unconsciousness accompanied by convulsions is caused by anæmia is demonstrated particularly well in a bloodless manner by applying the electric current to the brain of turkeys. With them the vascularised red comb and gill turn pale owing to the vascular spasm caused by the electric irritating action, and the animal itself becomes unconscious at the same time. The electric irritation acts on the vasomotor centre which normally keeps the arterial vessels in a certain condition of tension (tonus), and by excitation of this centre causes a derangement of the blood circulation in the cerebrum which leads to unconsciousness. On the other hand, the anæmia causes in the medulla oblongata the phenomenon of tonic-clonic spasms as the reflex-impeding action originating from the cerebrum is eliminated.

Thus, whoever wants to give a correct opinion on the manner of action of electric currents on the central nerve system must become conversant with the manifold results of biological research. I should not stand up for electrical stunning for the purpose of humane killing if the absolute unconsciousness and insensibility of the animals thus treated were not really warranted. Just because the mechanics of the unconsciousness of animals produced on an electro-spastic basis can be seen so clearly and faultlessly, any doubts on this point show the absence of biological knowledge of the subject.

Viewed physiologically, the phenomena appearing with cerebral anæmia must be defined in this way: that coma and spasms are the secondary phenomena

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of an impeded flow of blood to the brain. *In the opposite way, from an impeded flow of blood to the brain by electric irritating action of corresponding strength there follows coma simultaneously with the spasm.*

For animals on which an electric current is allowed to act, the following rule of general validity may therefore be established: *Any current that is not deadly has a stunning effect if the body is exposed to an electric current producing spasm, in such a manner that at least one pole is arranged in close proximity to the cerebrum.* If both poles are arranged at a distance from the head, spasms are obtained whilst still conscious, subject to the strength of the current itself being able to produce electro-spasm; whilst, on the other hand, it is not so strong as to destroy the vitality of the body of the animal.

Whilst an electric current of such strength as to produce spasm immediately causes coma, when acting from the cerebrum, weaker currents not producing a true muscular spasm only cause a soporific state, which Weinberger pointed out in his essay in THE VETERINARY JOURNAL, 1934, No. 8. Also, in the case of *stunning by shot, tonic-clonic spasms appear.* Nobody concludes from these spasms the presence of consciousness, though even with stunning by shot a re-awakening of consciousness may be observed sometimes after a gradual disappearance of these spasms. The physiological explanation of the origin of these spasms must be looked for in the injury done to certain centres of the cerebrum.

If, before bleeding, the butcher, with a series of heavy blows with a blunt axe, smashes the skull of an animal struck down unconscious by a bolt-shot, this is done for the purpose of ending the spasmodic condition which has set in with the animal which has become unconscious. Only after a series of very heavy blows, or by smashing-up the brain, the spasms caused by stunning by shot cease, which spasms would otherwise bring about a venous engorgement, and consequently an incomplete bleeding. Frequently a cane is introduced into the forehead through the shot channel instead of smashing the skull. Here, too, reflex mechanisms occur which are often interpreted as signifying that there is still a capability of sensation of pain with animals stunned by shot. The purpose of this procedure is the destruction of the medulla oblongata from the shot channel. Under reflex movements, which are rather accentuated in the beginning, the spasmodic condition existing also with stunning by shot in spite of unconsciousness ceases. Thus a better bleeding of the animal body after dealing the breast-stab is achieved. All this has nothing to do with a condition of consciousness accompanied by excitation, neither here nor with electric stunning. The result of the biological investigations stated above may thus be summarised as follows: (1) *Any impediment of the flow of blood to the brain in a manner deranging the change of matter produces unconsciousness accompanied by simultaneous tonic-clonic spasms.* (2) *With electrical stunning of cattle the muscular spasm appearing at the moment when the current is cut in produces a complete unconsciousness and insensibility, setting in at the same moment in consequence of anæmia of the cerebrum. By stabbing the animal to bleed it to death in comatose condition, the physical death*

of the animal is caused in a manner not noticeable by the latter, without consciousness being regained.

Thus it has been made clear from *physiological* points of view that the spasms produced by the electric current bring about anæmia of the brain, and that the latter produces the desired unconsciousness. With an interruption of the electric current also, the physical relaxation of the animal appears in the same manner as with chemical stunning, except that the electric irritation of the central nerve system may show certain subsequent effects inherent to the epileptiform character of the produced condition accompanied by unconsciousness. Finally, I do not wish to pass over in silence why it is tried again and again to create erroneous opinions with regard to the method of action of electrical stunning. To my mind the underlying motives are as follows :

(1) It is well known how tenaciously Jews adhere to having as many animals as possible bled to death in the meat trade, *i.e.*, killed according to the Jewish rite without stunning. As far as I know, about 80 per cent. of the animals slaughtered in London are killed according to the Jewish rite.

Contrary to stunning by shot, electrical stunning permits rendering animals unconscious *without damaging or injuring vital organs of the animal.* This is the condition under which Jews consider stunning to be admissible in killing according to their rite. But now the Jews do not want to stun cattle, and in spite of this they want to kill them according to their rite without stunning. This might explain the endeavours of Jews who assert that electrical stunning is not stunning, and that consequently its application in killing according to Jewish rite is to no purpose.

(2) In a similar manner, those who are agitating public opinion do not want stunning by bolt-shot to be replaced by electrical stunning, falsely pretending, against electrical stunning, that by the latter method only a spasmodic condition, but no condition of unconsciousness, was produced. How wrong this statement is I have explained above. Of course, if for the price of one shot cartridge 100 animals and more can be stunned by electrical methods, it becomes intelligible why those for whom stunning by shot is a business do not want this business to be interfered with by a method of stunning *which is far cheaper and better than stunning by shot.*

I, personally, am in no way concerned with the business of either of the two methods ; but since I have introduced with Weinberger the electrical stunning method in the practice of slaughtering, and since this method has helped humane slaughtering in an extraordinary manner, I, as a champion of the greatest possible introduction of humane slaughtering methods, have a very great interest in the method of action of the electrical stunning method not being discredited by false explanations and assertions. On the contrary, *the method of electrical stunning ought to be introduced more and more in the slaughtering practice by veterinary surgeons, butchers and meat packers, as the greatest advance of the last few years in the field of humane slaughtering, so as to meet in this manner the general demand for speedy and painless killing of the animals.*

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OXFORD DOWN SHEEP.

By HUGH W. STILGOE.

It is now rather more than a hundred years since the establishment of the Oxford Down breed, it being formed about the year 1830 by mating improved Hampshire and possibly a few Southdown ewes with Cotswold rams. The breeder's aim was to secure an animal with the mutton qualities of the Down and the hardiness and extra weight of fleece of the long-woolled hill sheep. It is interesting to note the success which the breed has achieved in carrying out the aims of those early breeders, for there is probably no more cosmopolitan breed of sheep than the Oxford Down. It is the largest of the Down breeds, with the following distinguishing characteristics: A bold masculine head well set on a strong neck, with poll well covered with wool. The face a uniform dark colour, the ears a good length, the shoulder broad, with a broad breast well forward. A full level back, the ribs well sprung, the barrel deep, thick and long, with straight underline. The legs are short and dark-coloured, standing square and well apart. The mutton is firm, lean, and of excellent quality. The whole body is covered with wool of close texture, good length, and fine quality.

Such qualifications have made this breed popular over the whole of North and South America, Canada, Sweden, Denmark, Germany, Switzerland, France, Spain, and generally over Central Europe and Russia, in addition to which a few sheep have been exported to the Continent of South Africa, and pure-bred flocks exist in most of these countries. Turning to the home market, the breed has gained most popularity from about the level of its home in Oxfordshire, through the Midlands, and the North and East of England to the North of Scotland and throughout the whole of Ireland. Its hardiness, derived from its Cotswold ancestry, has made it the most popular of the Down breeds for crossing with the half-bred and mountain sheep of Scotland and the North of England, for which purpose it is without doubt unequalled as a short wool. In fact it is fairly definitely established that no other breed of ram can withstand the conditions to which these sires are subjected when turned out with the hill breeds, as well as the pure-bred Oxford. In addition it is very prolific, and it is quite general for pure-bred flocks which are used exclusively for ram breeding to produce 150 per cent. of lambs from 100 pure-bred ewes. Again, a great tribute to the fecundity of the breed.

Additionally, these cross lambs can be sold either as fat in the spring or early summer, or kept on as stores and fattened off in the winter, and it is interesting to note that at the time of writing this article, when the lamb sales in the North of England and Scotland are in progress, that the Oxford cross lambs invariably top the market.

SUFFOLK SHEEP.

By G. P. LEMPRIERE,

Secretary, The Suffolk Sheep Society.

MANY years ago there was a breed of sheep known as the Norfolk Horn, which used to roam the waste lands and heaths of Norfolk, and which was renowned for the flavour of its mutton. The breed was hardy, lambing out in the open, exposed to all the fierce, cold, east winds blowing in from the North Sea. They were very active sheep, with black heads and legs, and were noted for early maturity. They carried a fleece of fine quality wool. The famous Coke, of Norfolk, realising the many fine qualities of this breed, set himself the task of improving their conformation. To do this he mated a Southdown ram with them, and the result was a much improved sheep. Selection and improvement went on until in 1860 the breed became recognised as a fixture, and was then known as the Suffolk sheep, as most of the flocks of this new breed were located in Suffolk. The Suffolk Sheep Society was formed in 1886, with the particulars of forty-six flocks in the first volume of the Flock Book.

Since that day the breed has steadily and continuously been increasing both at home and in many countries abroad, until to-day there are found 366 registered flocks in Great Britain and Ireland, stretching from Sligo to Cork and from Ross-shire to Cornwall, besides many flocks in United States of America, South Africa, Australia, Spain, and in fact in practically every country in the world. This very rapid and vast distribution has taken place through the many merits of the breed. It is particularly noted for its hardiness, fecundity, early maturity, abundance of lean meat with the minimum of waste. These qualities make the Suffolk the most popular crossing sheep of the present time, both at home and in many places abroad. Evidence of this is forthcoming yearly at the Smithfield and Scottish National Fat Stock Shows, where the cross is always to the fore. The Suffolk, or its cross, has many times won the supreme championship at these shows, both in the live and carcase classes, and has for the past eight consecutive years carried off the championship at the Rand Fat Stock Show (South Africa's Smithfield).

The crossing qualities of the Suffolk are recognised in Scotland yearly by the prices given for rams at the Kelso Sale. Last year 783 ram lambs averaged £11 6*s.* 3*d.*, an extraordinary average for crossing rams, and a proof of the merits of the breed.

If any fault is to be found with the Suffolk it is perhaps in the fact that very often it is too prolific—anyhow, in ram-breeding flocks, where too many lambs are not wanted.

One of the merits of the breed which is greatly appreciated overseas is its activity in service and the very little assistance needed to ewes when lambing after service by a Suffolk, as the somewhat narrow head gives little trouble during

parturition. The future of this breed must be a happy one just so long as breeders continue to take the necessary care to keep their flocks up to their present state of excellence.

THE DORSET DOWN BREED OF SHEEP.

By E. B. DUKE,

Secretary, The Dorset Down Sheep Breeders' Association.

THE Dorset Down are essentially a rent-paying type of sheep, especially adapted for thick stocking, and are noted for their fecundity. They are of very resourceful character, being capable of producing either sucking lambs at from ten to twelve weeks old of the primest quality, from 40 to 48 lb. in weight, or at eight to nine months old of a well-finished carcase, weighing from 66 lb. to 72 lb., of the very best quality of fleshy mutton, thus meeting the preponderating demand of the dead meat market for joints of more quality and less waste.

For the last thirty years the washed Dorset Down wool has been ranked as the finest of the English wools, and has been favoured by merchants and manufacturers to the extent that it has realised the highest price in England each year at the Dorchester Sale.

In briefly tracing the origin of the Dorset Down breed, it will be necessary to go back some 130 years, when a Mr. Thomas Homer Saunders, of Watercombe, near Dorchester, commenced his work of improving the class of Down sheep then generally bred in the county. He considered that although a "kindly" race of sheep, they were deficient in size, and therefore he selected the largest ewes he could find, which in many cases were descended from the flock of Mr. Ellman, of Sussex (who in his day did much to improve the Southdown or Sussex breed), and crossed them with rams of still larger size, and so by judicious crossing and keeping a careful pedigree to help him, he in his time created the type of sheep that ultimately became known as the "Watercombe Breed of Improved Hampshire Downs," with which both he and his son, Mr. Thomas Chapman Saunders, stamped the Dorset Down sheep of the county, and achieved remarkable showyard fame in the short-woolled classes of their day.

A good type of Dorset Down should be free from all coarseness, the chief points being a rather long, full, clean face and under jaw, with a bold bright eye and full muzzle, the ears should be fairly long, thin pointed, whole coloured, and carried well above the level of the eyes; the neck strong and well set on. The animal should be fairly fine-boned, and covered with a close fine fleece going well down to the hocks and knees, round the cheeks, between the ears and on the forehead; but wool under the eyes, across the bridge of the nose, or on the ears is to be avoided. It is desirable that the face, ears, and legs should be of a brown colour. Although of finer bone and lighter colour, the Dorset Down is closely related to and possesses the principal features of the Hampshire Down type, modified by local conditions.

DEVON CLOSEWOOL SHEEP.

By F. O. SAUNDERS,

Joint Secretary, The Devon Closewool Sheep Breeders' Association.

THE breeding sheep known as the Devon Closewool, whilst not being indigenous to any district, has been on the moorlands of Devon and Somerset for a number of years, and is thought to have been developed from a cross between the Devon Longwool and Exmoor Horn.

Aims.—The aim of the breeder for a long period of years has been to produce a sheep that would breed true to type, without the distinctive characteristics of either Exmoor Horn or Devon Longwool, and they claim now to have succeeded in that object. In support of this claim it may be stated that this breed has been kept and bred on the same farms and has maintained its distinctive characteristics for quite thirty years, without the breeder having recourse to any other breed. It is well known for its ability to adapt itself to widely differing conditions, thriving well on fairly open country and fattening in pens, either with or without a grass run. The wool, which is a distinctive feature of this breed, as the name suggests, is very close and dense, hard to the grip of the hand, and being of medium length and staple finds a very ready market.

Provided they are not run too thickly, no artificial feeding of any kind is required by the ewes during the period of gestation, and provided also that pastures are in fair condition, they will fatten their lambs without any artificial aid. There is no doubt that the Devon Closewool is a very fine and handsome class of sheep. Of their progress during the last ten years or so, it is generally felt that the breeders and the breed can be justly congratulated, for the general improvement in the Devon Closewool is a striking tribute to both.

Features.—The distinctive features of the male is masculine in appearance: broad, dark nose; short, thick ear; crown of head well covered; good bone; short legs, standing broad; deep chest; back straight and wide, ribs well sprung, with big thigh and tail. The ewes should possess the same qualities, without the masculine appearance.

Unfortunately, mostly owing to the few exhibits entered for the larger shows, the breed is not so well known as it should be, for it is generally agreed that as a dual service breed it is in most demand. The Devon Closewool should be more to the fore than it is at present: it possesses fine and valuable wool, and the mutton, too, is excellent, being of medium size, which is the size required by the butcher.

With reference to the disease of the breed, it is an exceptionally hardy and healthy sheep, perhaps being less susceptible to liver fluke than any other breed. Where the climate is unstable the Devon Closewool will prove exceedingly successful.

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THE DARTMOOR SHEEP.

By S. ARTHUR YEO,

Secretary, The Dartmoor Sheepbreeders' and Flock Book Association.

THE Dartmoor sheep, renowned in the south-westernmost counties of England for its all-round excellence, takes its name from the wide expanse of moorland known as Dartmoor, on which it, to a great extent, lives.

The Forest of Dartmoor, or, perhaps to be more correct, the Waste of Dartmoor (as there is no forest in the accepted sense of the word) extends to about 300,000 acres, and is situate in the centre of the County of Devonshire. It is composed of rough, principally uncultivated, heath land, and the herbage is accordingly scanty and practically confined to coarse natural grasses, reminding one of the ranches in the Argentine. It is exposed to every wind, experiences a very heavy rainfall, and in winter is exceptionally bleak. The land is at a high altitude, varying from 500 to 2,000 feet above sea level. There is a variety of soils and subsoils, and conditions on the Moor vary considerably; much of the pasturage is very poor indeed; there are, however, more favoured localities; but whether rich or poor, the undisputed fact remains that no other breed has been found so pre-eminently suited to the soil peculiarities as the subject of this article. Many experiments have been undertaken, but nothing has yet been proved able to compare with the sturdy and hardy Dartmoors. On this more or less barren tract the Dartmoor flocks are summered, and in consequence own much of their robust constitution to its invigorating climate. About the latter end of August, or early in September, the flocks are brought in, and preparations are made for the crop of lambs which usually arrive early in March; in sheltered districts lambing in February is often in full swing.

Most of the wether lambs are fatted off at about ten to twelve weeks old, making a choice carcase of from 35 to 40 lb., these command a ready and good sale, the bulk going to London and various seaside resorts. The remainder are kept on to go out at from ten to twelve months old, and at this age the mutton cannot be excelled. The carcases are remarkably lean and the meat extremely juicy. As a result of judicious breeding the joints are now of the size the consumer demands, and there is no waste whatever through any excess of fat. The ewe lambs are allowed to run with their mothers until shearing time (about the second week in June), when they are shorn and produce from 4 to 6 lb. of wool. The flock ewes will shear from 12 to 16 lb. of wool. The wool of the Dartmoor sheep is of a first class quality, tough, fine in texture, long and lustrous, and herein is found one of its greatest assets, the fleece weighing wonderfully well. It is quite common for a ram to clip 27 to 30 lb., and when wool prices are good the return to the flockowner must always be pleasing.

The provision of excellent mutton and a large quantity of wool are the chief characteristics of the Dartmoors, and it is suggested these are essential points to

be studiously regarded when the all-important question—that of a selection of a breed—is being considered. The facts just mentioned do not by any means exhaust the vital qualities sought for in all breeds and possessed in full by this moorland type. The ewes are very prolific, bringing about 60 to 70 per cent. of twins and 5 per cent. triplets; they are also excellent mothers, having an abundance of milk; consequently early maturity of lambs in order to catch the Easter trade is usually obtainable.

The Dartmoor sheep, owing to their immense strength of constitution, can care for themselves to a far greater extent than many other breeds are capable of doing, and will thrive on pastures where others can scarcely exist. Very little folding is practised with Dartmoors, the flockowner preferring to cart the roots on to the pastures as they are required. Draft ewes are sold to go into all parts for production of fat lambs, and are crossed with almost every mutton breed known —a striking testimony to their outstanding maternal properties.

Export.—The export of Dartmoor sheep to countries abroad has not been in evidence to any material extent, probably owing to the fact that the demand " at home " has been so continuous. Latterly, however, there has arisen many inquiries from overseas, particularly from South Africa, the United States, and the Argentine. Shipments have been despatched and reports are very pleasing. An official of the Ministry of Agriculture in Japan has also made an inspection of Dartmoor flocks, and his opinion as to their suitability for that country was very favourable. Breeders are satisfied that a trial of the Dartmoors will convince flockowners of their pronounced crossing qualities and the certainty of bringing up to concert pitch the strength of flocks whose stamina has been sapped or in which marked deterioration has set in.

LINCOLN LONGWOOL SHEEP.

By E. P. TAYLOR,

Secretary, Lincoln Longwool Sheep Breeders' Association.

THE Lincoln Longwool is famous as a wool producer, and is a large and heavy breed of domesticated sheep; it is white-faced with a woolly tuft on the forehead and is exceptionally free from foot rot. It somewhat resembles the Leicester, but is rather bigger, and produces a heavier type of wool, but not quite so fine in quality. The staple of the Lincoln is both wider and longer and more dense in texture; the wool is soft to the touch, fine, curly, lustrous, strong and of uniform character. They produce a big carcase and a heavy fleece. The unequalled power of wool production, and large size, weight and symmetry of carcase, have brought the breed into the highest repute in all sheep-rearing countries.

The present-day Lincoln sheep, the creation through crossing the coarse, large-sized old Lincoln sheep with the English Leicester, is probably the largest

of all England's sheep and one of the most valuable amongst the world's sheep breeds for crossing. They are most suitable for early maturity crosses, and it is undoubtedly true that few other English breeds produce such a remarkable first cross as Lincolns, particularly shortwool crosses on Lincoln gimmers. The Lincoln, owing to its great wool and mutton properties (45 lb. of washed wool has been known to be clipped from the Lincoln ram) has become increasingly popular in recent years for crossing purposes, rams being sent for this purpose into all parts of the country. The breed has done more in the past to grade up the native breeds of other countries, both in wool and mutton production, than any other of our established breeds; over 70,000 Lincoln sheep have been exported for this purpose during the past thirty-six years. The Lincoln is bred extensively in Lincolnshire, parts of Yorkshire, etc., but best thrives in their own county of Lincolnshire, or in cold climates; they are very hardy, whole flocks being folded on roots and sugar-beet tops in the winter months, and in summer they are grazed either on grass or temporary pastures. A great feature is their early maturity and aptitude to fatten. Another feature peculiar to this breed is that whenever a Lincoln ram has been crossed on an indigenous ewe, the first cross has invariably produced wool considerably finer than its progenitors, although as a rule shorter in staple. No other longwool breed in England produces wool of such lustre and high quality as the Lincolns. They possess length of body, with widesprung deep ribs, and their movements are peculiarly attractive, with their strongly developed heads, expanding nostrils and clear bold-looking eyes.

BORDER LEICESTER SHEEP.

By Miss R. E. J. GRANT,
Edinburgh.

THIS is one of the breeds of British live stock about whose origin there is no doubt. They are the lineal descendants of the Dishley Leicesters, made famous by the work of Robert Bakewell (1726–1795), of Dishley, Leicestershire.

Introduced into Northumberland in 1767 by the Brothers Culley, who were pupils of Bakewell, these improved Leicesters were soon established on both sides of the Border. When these brothers wanted fresh blood they invariably had recourse to Dishley. When Bakewell died a number of his neighbours formed themselves into the Bakewell Club, and bought up his sheep with the object of maintaining their purity. From members of this club the northern breeders continued for many years either to purchase or hire rams. To-day flocks are to be found all over Scotland, Ireland and Northern England.

The chief object which breeders have in view is undoubtedly the production of rams, as it is to the Border Leicester ram's pre-eminence as the sire of quickly growing, rapidly maturing cross-bred lambs, that the breed has maintained its great popularity for over a century. Being a thick-fleshed and rapidly maturing

sheep when crossed with thin-fleshed and slow-feeding ewes, the offspring is a quickly maturing sheep with better quality mutton than the sire, and a greater quantity of it than the dam. Although he has a heavy carcase of mutton, he carries it on fine bones, and hence when he is crossed with smaller ewes there is less risk of loss during parturition than is likely to result if strong-boned, coarse-headed rams are used. These facts justify the claim that the Border Leicester, of all British breeds of sheep, is the most valuable crossing sire in existence.

Description.

Perhaps the best description of the appearance and general characteristics of the breed, so far as they can be set down on paper, can most easily be derived from a detailed account of the points of a shearling ram as he would appear in the show yard or sale ring at sixteen to eighteen months old. He will stand about thirty-two inches at the shoulder, and will measure about forty inches from the crown of the head to the tail. He has a wide, level back, well and evenly covered with mutton that is firm under the hand. His well-sprung rib gives him the width of back that is so desirable, and it also enables him to carry his stomach high so that his underline is almost as straight as his back. The head should be masculine, with slightly aquiline nose and well-developed muzzle. The nostrils should be wide and dark. White or pink noses occasionally appear, but as they denote a weak constitution, they are looked upon with disfavour. The eye should be clear and bold, the crown smooth and devoid of wool, the ears evenly set on.

The skin of the head should be of a pale-pink colour, and well covered with pure white hair. Black spots will occasionally appear on the head and ears, but while not regarded as a serious blemish, they are not favoured by breeders. The neck, tapering nicely from the head, should be strongly set in at the shoulders—there must be no slackness at the junction. The neck vein should be well developed and the brisket brought well forward. The shoulders should slope gently to the ribs and thus avoid narrowness at the head. The loin should be wide and firm and the quarters long and deep, the gigot filling the hand well. The legs must be squarely set under the body, strong, with clear flat bones covered with perfectly white hair and quite free from wool. The whole body above and below should be evenly covered with white wool of equal quality throughout, and comparatively fine staple—curly, but not open to the skin. If the ram has all these desirable characteristics he will be evenly and symmetrically balanced, and will be able to move freely and carry himself with a gaiety that is equalled by few of his species. The above description may be applied to a shearling ewe or gimmer, making due allowances for the difference in sex.

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THE VETERINARIAN AND SHEEP PRACTICE; ESPECIALLY AS IT RELATES TO INTESTINAL PARASITES *

By COOPER CURTICE,

Bureau of Animal Industry, Vienna, Virginia.

It has been said that there are three troubles of sheep raising: "Politics, dogs and diseases." With the first we as veterinarians have nothing to do; to the second has been ascribed, by the sheep owner, the downward course of the industry; while of the third but little is said or known, and that little usually by the veterinarian.

Owing to high values of wool and mutton on account of recent conditions, farmers have agitated for, and have in some instances secured, new legislation to cope with the predatory dog; whether a "joker" in such legislation and lax enforcement will not annul the apparent intent of these laws, as such has occurred in the past, remains to be seen. If we may believe the universal testimony of farmers that diminution of sheep on eastern farms is due to the dogs, the veterinarian who would expect some part of his living to come from sheep practice will have to take a deep interest in preventing their depredation in order that he does his part in the up-building of the industry. No sheep, no sheep practice. But what is more to the point for the veterinarian as one of the consuming public is: no sheep, no lamb, nor mutton, nor wool for woollen garments excepting at a prohibitive cost, if at all. If the public expects mutton and wool to grow themselves or to be grown in spite of uncontrolled dogs they will have to look to other lands for them if they get any. Just so long as the farmers believe that the dog will destroy sheep over night, just so long will they refrain from raising these in any numbers. Fortunately most of the dog losses may be avoided by confining the sheep in a dog-proof pen or cote each night. This involves labour each night and morning, and undoubtedly is inferior otherwise to allowing the sheep the full liberty of the fields, but is far safer. May we arrive at the time when sheep owners can leave their sheep safely within their fields and not be subjected to the costs of housing and loss in grazing during the cool of the day through the hot season.

A confession that the writer has not had much sheep practice in the North, especially as he has come so far to talk to you, may seem strange. His experience in New York is limited to less than a half-dozen calls. He cannot, therefore, base his talk on a personal assurance that certain diseases do or do not exist in this State. A case of copper poisoning resulting from salting sheep in a copper kettle which also collected rain water; a case of over-fattened yearling ewes which had been fed too highly on Canada field peas and oat-hay and corn; and

* Paper read at the New York State Veterinary College at Cornell University, Ithaca, N.Y., and published by permission of *The Cornell Veterinarian*.

another in a nearby county in Pennsylvania caused by feeding the ewes and hot-house lambs on cabbage and over-pasturing a too small area of grass, thus producing one of the worst cases of gelatinoid degeneration of the intra-peritoneal tissues accompanied by gross intestinal parasitism that it has been his fortune to see. These sum up his principal New York cases. Outside of New York his chief work in sheep has been concerned with intestinal parasites. Since this has been mainly in a warmer country with a longer summer and a correspondingly shorter winter, his ideas of occurrence of various parasites may not be entirely proper for more northern climates where the distribution of these parasites may be influenced by low temperatures.

Your professors have, or will instruct you, in the foundations of medicine and surgery ; upon these you will be able to build your practice in the non-contagious and non-parasitic diseases of sheep. You that undertake country practice, either private or public, will find most diseases of sheep arise from faulty conditions in feeding and housing. The more primæval conditions of wide range in pasturing and open life in comparatively rainless and snowless regions are departed from, the more sheep are modified in external and internal characters to conform to the demands of men, the more they are subject to changes of tissue which lead to disease. Close confinement on fields and pasture, abundant forage and grains of kinds that their systems cannot well assimilate in health, and housing necessary to protect against rain, wind and snow, but deleterious when causing too much warmth and draughts, are the factors that produce disease. Those of you that have the keenest insight into farming methods as they apply to feeding and housing of livestock will be those whose advice will be worth most to the owner. The daily lives and actions of the sheep and the previous uses of pastures and runs must enter into your diagnosis and treatment.

The external parasites of sheep are easily reached and easily treated. The main thing is the first expense of a dipping-vat, or whatever may be used in place of it. Vats are cheap where there are many sheep because they save labour. This is aside from their great efficiency. But when the flock is small and the labour requirement less, smaller plunging tubs are more economical of labour and material. Two or three persons can dip a hundred or more sheep in a tub of suitable size in a short time. Sheep ticks will need the most attention in eastern flocks, although scab may not be entirely absent from the country. Either may be eradicated from any flock, and by attention to new arrivals may be obviated, by comparatively few serial dippings.

There seems to be no good treatment for the nose maggot or gadfly—*œstrus*. At least I cannot vouch for any, not having tried them out. Methods of hurdling and field changes used in our work seem to have reduced them ; but as special records of conditions influencing them have not been studied, no positive formula for their treatment can be given.

Some years ago the bureau investigator, B. H. Ransom, quite thoroughly worked out the life history of the stomach roundworm, *Hæmonchus contortus*.

He showed that the embryos were longer in maturing in cold weather, and that in hot weather they probably did not arrive at the proper stage for development when ingested by lambs in less than ten days between the ewe and the lamb. By adopting the stomach worm as a standard, a method of procedure has been undertaken with a view to controlling roundworms in sheep. April lambs have been successfully raised at our Vienna, Va., farm. We tried hurdling lambs on clean newly-planted grain fields each ten days at first, and succeeded in rearing them into September, with exceedingly few parasites, whether they were ranged with their ewes or not. Owing to the necessity of suckling the lambs and the probable direct development of the worms, a very few worms were always found in our post-mortems, but these never in sufficient numbers to practically interfere with the lambs' growth. They offered, however, an obstacle to the complete eradication of the worms in a season, if not eventually. Two-week intervals in hurdling have yielded apparently as good results as ten-day intervals, but three weeks have not. Lambs raised by using the latter interval in hurdling have, however, thriven and not had many worms on test counts.

Post-mortem examinations of lambs five months old that have been hurdled as above described and weaned at about three and a-half months have shown an absence of lungworms of the two species usually found : of hookworms, *Buonostomum*, and of tape worms, *Moniesia*. A few of the stomach worms, *Hæmonchus*, occasionally a hook worm, more often a few nodules of *Œsophagostomum*, together with a few adult nodular worms, occur. The whipworm, *Trichuris*, of the cæcum is scarcely ever found.

When lambs have been weaned and then grazed on comparatively large fields hitherto unused during the same growing season by sheep, and changed as opportunity warranted for consuming weeds in stubble fields, they have yielded low egg counts until the following spring or until practical danger to the lamb is past.

The method of field-hurdling demands close attention to details and considerable labour involved in changing hurdles or fences. Owing to the small acreage of clean rye or oat land that has been available, most of our lambs have been pastured separately from their ewes after keeping them up in the stables for the first month or six weeks, and allowing the ewes the use of their old pasturage at first evenings and mornings, but returning them to the lambs through the heat of the day and nights. After the second month the ewes are only necessary to the lambs during the night. By primary division of large fields into long narrow strips, with portable or temporary wire-net fencing and the use of hurdles for subdividing these strips, labour of fencing is greatly lessened. We have not had the advantage of subdividing a grass field or meadow as yet, but are looking forward to it. Growing oats earlier and millet or cow peas later has been our main reliance for forage. Undoubtedly second crop clover and grass land would be much better providing the old sheep have not had access to the field.

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Cornfields with the main blades well above the reach of the lambs have furnished excellent foraging grounds.

Hall and Foster, in their research work on the " Efficacy of Some Anthelmintics " (*Jour. Agr. Research*, Vol. xii, No. 7, D. C., February 18th, 1918) detail their experiments in the use of copper sulphate in 100 cubic centimetre doses of a 1 per cent. solution for roundworms in grown sheep and half doses for lambs. In the writer's experience a few fatal cases have occurred in lambs where 1 c.c. is given for each pound of weight, apparently on account of the severe erosive action of the drug. In cases of severe helminthiasis the benefits derived from administration far outweigh the losses. The fatal cases cannot at present be explained, are seemingly dependent on individual conditions, and occur in less than one case in fifty. Older sheep stand the dose quite well, but yet are not one hundred per cent. immune to its effects. Copper sulphate does not seem to be perfectly efficacious in its results, but is so efficient that by removing 93 per cent. of the stomach worms, as Hall and Foster state, 93 per cent. of the danger from that source is removed. If some small stubble field is then available for a month, and the dose is again administered, 93 per cent. of the less than 7 per cent. remaining will be removed, or less than one-half of 1 per cent. remain.

Dosing sheep is a comparatively easy matter and practically safe when details are attended to. Comparatively little apparatus, consisting of heavy tubing a yard in length and five-eighths inch thickness with a bore calibre of three-eighths ; six inches of piping such as is used by plumbers to conduct water into toilet flush-tanks, size three-eighths inch ; and a three-inch rubber funnel with hard rubber connecting tube will do. One assistant catches the sheep, holds it standing between his legs and inserts the iron piece in the mouth. As the sheep chews upon it the veterinarian pours the required dose by intermittent swallows into the funnel, holding the latter high enough to give the fluid free way and not collect in the pipe. If the head is not held too high there is little danger of running the fluid into the windpipe. The inserted end of the tube should be just at the point of the tongue where swallowed things must go down, and not thrust too far back. Solutions should never be of strength to erode membranes, but, in the case of copper-sulphate solutions, of full strength to kill parasites and not erode the sheep. An extra assistant to catch animals and well-arranged catching pens and shutes greatly reduce the time required.

The larger apparatus described by Hall and Foster, consisting of a keg with a rubber tube attachment leading to a dose graduated burette and a rubber tube connection entirely similar to the above described, with perhaps a softer rubber tube and regulating pinchcocks within easy reach, is all that is necessary to dose large flocks rapidly. Of course, pens and shutes must be conveniently arranged. For flocks of not over two hundred the simpler method is preferable. If the ewes are dosed just after lambing, and a second time perhaps in two or three weeks, the opportunities for lambs acquiring stomach worms while suckling and confined with their ewes are reduced, theoretically 99.55 per cent. Practice

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seems to bear this out. With such treatment and the use of a succession of clean fields at three weeks' or a month's interval, I believe it is practical to raise April dropped market lambs. However, a more rigorous course should be followed with the ewe-lambs which are desirable to save for the future flock. Close oversight should be given to these until frost time, and from early spring onward until they have joined the main flock.

There is plenty of work in assuming oversight of a flock of sheep by the veterinarian. There is first a study of pasturage conditions; second, a diagnosis of the trouble, if any, and its degree, and finally a prescription for it and its administration if medicine is advised. Of course, the main symptom of stomach and other worms is that of pernicious anæmia, as indicated by whitened eyeballs and dropsical swelling of the visible mucous membranes and puffiness under the throat. But the main diagnosis should rest on the microscopical finding of eggs of various species of worms in the fæces. The droppings are collected by inserting the index digit in the rectum of the animals. It is best to collect from each of the flock. To hasten the operation, all the sheep should be placed in a pen or shute. If pen, then a movable hurdle should be arranged so that the constantly diminishing numbers of sheep may be crowded to facilitate catching. Each sheep should have an identification ear-tag. Our original flock was numbered 1 to 100. Now many have dropped out. The lamb of 83 was tagged 183; the second 283 and the third 383. The lamb of 183 was tagged 1,183, and the second 2,183. By this method we hope to be able to identify the families and the age at a glance for the next ten years if necessary. Powder papers about two by three inches, a pencil for numbering each, and a pail of water are necessary implements. The hand should be rinsed between each operation. Two operators are necessary: one to hold the animal and mark and fold the paper, and the other to catch the animal and take the specimen. The specimen papers should be dropped into a humidor, preferably a wide-mouth glass can.

The laboratory examination is comparatively simple. The necessary implements are: a compound microscope giving at least 100 diameters magnification; glass slides measuring three inches by one inch; a small bottle of water with pipette and rubber-nipple top; a box of toothpicks; a glass jar or bowl for holding 2 per cent. creolin solution for receiving dirty slides; a container for rejected papers; soft paper for cleansing slides; and pad and pencil for records. Examinations: one takes a very small bit of dung on the broad end of a clean toothpick and thoroughly mixes it on the slide in a few drops of water, or sufficient to cover about one-half of the central area of the slide. No cover glasses are necessary for this rough work. Then every part of the field is examined for the presence of worm eggs. Though not absolutely necessary, a mechanical stage permitting the specimen to be methodically moved is of great assistance. The microscopic field presents a great variety of detritus. The greater part of this is unconsumed vegetation of irregular form. All sorts of plant cells, plant hairs, starch grains, fungi, bacteria, and sand particles occur. At times cellular tissues from the sheep

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occurs. But the worm-eggs to be sought for stand out clear and distinct in the debris when the layer of water examined is not too opaque with other material. Their form had best be learned by examination of eggs taken from a sheep slaughtered for food. At that time a few worms can be selected from their habitat in the intestines, and a study of their eggs made in order to associate their form with the worms. If the student is lucky enough to find a tape worm, so much the better, for the form of the embryo is different from an egg, being more polyhedral. It is also more opaque, although slightly translucent when turned certain ways. It is much larger. There are few organic forms that may be mistaken for tape-worm eggs (?); these are apparently spores of fungi. But a little study will inform the student as to essential differences. Material is so readily available that pictures of these forms are not necessary. The living material should be studied. Some of the nematode eggs are so nearly alike that it is hardly practical to take time to differentiate them; they may be listed as all of *Hæmonchus contortus* or stomach-worm size. These include the stomach-worm, the hook-worm of the jejunum and the nodule-making worm of the colon. Others, like the whipworm of the cæcum, the thread-necked worm of the jejunum and stongyloides, are characteristic. These are the more important intestinal nematodes of the eastern United States. The numbers of eggs found on a given slide will give the investigator an idea as to the amount of worm infestation. No eggs or three or four usually indicate a slight infestation; ten would not mean a necessarily severe infestation, but thirty or fifty would. Comparisons between specimens taken at the time of drenching, and a week thereafter, will indicate efficacy of the drug given. Those taken before removal from pasture and at weekly intervals thereafter will indicate to some extent the freedom of the field from parasites. Specimens taken at monthly intervals during a systematic hurdling will demonstrate the condition of lambs during the time of hurdling. Periodic examinations of a flock during the warm season will indicate their condition, and perhaps guide the veterinarian in his future advice as to certain pasture changes. A winter investigation will indicate the necessity of medication in order to prepare for springtime.

The œsophagus worm, *Gongylonema*, is more difficult to reach and, indeed, is worthy of little attention. Ransom and Hall have shown that the embryos pass through a species of dung beetle in their early stages. Pasturing the old sheep on stubble lands and ploughing the latter buries the beetles and reduces their parasites. Hurdling the lambs and cultivating the hurdled land soon after for new crops has reduced parasites in our experiments.

The lung worms have been held in abeyance by our methods, so that now it is unusual to find them, excepting in the lambs that are pastured with their dams on the old pastures that no attempt has been made to free from the worms. In these they are becoming more infrequent. Medication for these has not recently been tried at this farm. The writer has no knowledge of medicinal remedies that are satisfactory to use or efficacious enough to warrant their use.

The tape worms also have been reduced or entirely prevented in our experiments

by pasture rotations, while they have been all too present in other experiments involving infested pastures and their immediate surroundings. The embryos, whatever their host, do not seem able to go far, but can cross fences in contiguous small plots. Remedial dosing has not been extensively tried, but copper sulphate solution has undoubtedly removed adult tape worms during some of our dosings. There is much hope that these may eventually be eradicated and that the cost will not be excessive.

Liver flukes have not been found by the writer more than once, possibly twice, and that in sheep introduced from farther west at Colorado Springs, Colo. He regrets that he is unable to present definite information regarding them. The subject of prevention is open to him who finds himself in fluke-infested regions. Certain necessary operations of the skilful shepherd tend to reduce the worms, and should not be neglected by the veterinarian. Sheep and lambs do not seem to acquire many worms when kept entirely in the stable. Periodic removal of manure and restrawing the stable may facilitate their prevention. Certainly the pens should be restrawed weekly if the manure is not removed. Any stable moisture is not only not good for the sheep, but tends to enable the worm to thrive in their external life during hot weather. Weekly removals and stable arrangement so that the manure is kept absolutely dry is better; at least the manure should not seem wet.

Tagging the ewes, the removal of dung-locks at all times, and especially at lambing time, is demanded. While the greater portion of the wool around the udder has been removed, it seems as if sufficient dirt remained during the nursing period to account for preventing entire freedom of the lamb from worms acquired during nursing. Ewes whose udders were washed before each nursing yielded wormless lambs.

Docking the lambs at the time of castrating the males usually during their first week of life removes the tail and the subsequent risks of dung-laden tails. The operation is performed with an ordinary large-sized emasculator of the pincer-scissors type. For emasculating a smaller size is used. Two per cent. cresol solution is used for disinfection. We have lost not more than one or two lambs a year, although the operation has been performed by our attendants. Healing is quite rapid, there scarcely ever being a sore that needs subsequent attention.

In practice the sheep manure has been kept separate from other stable manure and spread on fields that were to be planted and cultivated for some time before admitting the lambs. It is probable that top-dressing grass-lands during late fall and winter will not seriously infect sheep if they are removed in early spring.

The foregoing has been based on the use of April lambs. It is reported as the experience of sheep-men that these are the more difficult to raise on account of stomach worms. Early lambs, those dropped from January to March, should not be difficult to raise with comparatively few worms, if any. Hot-house methods will easily bring the lambs to the time that they can be turned on to especially set-aside grazing ground, and need nursing only at night, or less often

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during daytime as the season advances. They may be almost if not quite large enough to wean when grass is ready for them, and with a few fence divisions previously prepared can take advantage of growing herbage. Marketing of the wethers reduces the numbers to be looked after. The only trouble with raising the ewe lambs is the tendency of the owner to unite them with the old ewes to reduce labour. If all are put on clean pastures this practice will not result so badly as otherwise. New additions should be added to the flock with aforethought, as it is not likely that all sheep men will be equally careful about worm infestation. Dosing the introduced sheep will help.

As time goes on and methods improve, it is far from improbable that worm-free flocks may be attained by some. Keeping the young separate from the old, marketing the latter as occasion offers, and certainly using separate runs, will reduce the worms, say, over 80 per cent. The same treatment of the young ewes with their first-born will reduce another 80 per cent., or to less than four per cent. Bad management in the past has been necessary to produce intense worm infections; good management has resulted in practical control of worm infections; better management will result in reductions to a negligible quantity; may we predict that best management will entirely eradicate some species of worms if not all?

Veterinarians will be required to initiate correct hygienic usages. The care of the shepherd will determine whether the doctors will be perpetually necessary or whether they will be necessary to periodically reduce losses already incurred. Death of sheep or lambs is but a final loss; that caused by the continuously nourishing a host of parasites is the great item. The writer's opinion is that internal parasites in the sheep east of the Mississippi have been the causes of the the most losses to the sheep industry; losses which have not been exceeded by political changes nor by predatory animals.

If successful the veterinarian will work himself out of a job, as he is doing in the South in eradicating cattle ticks; as has been done in the West in eradicating sheep scab; and as has been done in the North by eradicating contagious pleuro-pneumonia and foot-and-mouth disease in cattle. The time may come when Governmental oversight of sheep for the purpose of educating the flockmaster in correct hygienic care of the sheep may be demanded by sheep-men, and possibly control, or if later found feasible, eradication of round-worms. The veterinarian has met his duties wholeheartedly in the past, although he more than any others has foreseen an end to that portion of his duties, and has direct selfish interest in keeping up diseases that would require his perennial attention. The men that are veterinary sanitarians are capable of competing in the world with others of whatever calling that they may elect and fear not the day on which they shall have worked themselves out of a job. They are content with their daily wage and the feeling that they have done their best for their clients. That is why they have succeeded in eliminating animal scourges, almost against the will of their *clientèle:* the farmers of the United States. Veterinarians are of the salt of the earth. They see their duty and they do it.

Abstracts of Current Literature

Louping-Ill in Sheep and Benign Lymphocytic Meningitis in Man. By JAMES COLLIER, M.D., F.R.C.P., *Consulting Physician and Emeritus Lecturer in Neurology, St. George's Hospital; Physician to the National Hospital, Queen Square.* (Abstract from the Harveian Oration on "Inventions and the Outlook in Neurology," delivered before the Royal College of Physicians of London, October 18th, 1934.)

RECENTLY accident has revealed a principle which may have an important bearing upon neurological discovery in the near future. A virus expert was working at the Lister Institute upon the disease of sheep which is called "louping-ill" or "staggers." This is a virus disease which, entering by the usual nasal route, passes along the nerve threads to the cerebellum, and there kills every nerve cell while leaving the rest of the nervous system entirely unharmed. One day this pathologist became severely ill with acute meningitis, which was supposed at first to be tuberculous, but from which, however, he made a complete and rapid recovery. He went to America to carry on his researches upon louping-ill. Shortly afterwards two of his co-workers and two of his laboratory assistants were seized with severe acute lymphocytic meningitis, from which they rapidly recovered, and it was proved from the serological reactions and by infection of animals that the recoverable meningitis in man was due to the same virus which caused destruction of the cerebellum in sheep.

The principle is that an infection in an animal which gives rise in that animal to a definite and incurable disease may produce in man an entirely different and curable disease. We already had this principle demonstrated in the opposite sense in the virus of herpes febrilis, which in man produces an insignificant event, but when introduced into the rabbit is apt to produce a fatal inflammation of the nervous system. Nervous diseases are common in animals, and it is to the closer association of veterinary and human neurology, and the wide investigation of the two together, that we look with hope to the discovery of cause and treatment in those common nervous diseases which are at present entirely mysterious.

Reviews

An Introduction to Practical Bacteriology.—A Guide to Bacteriological Laboratory Work. By T. J. MACKIE, M.D., D.P.H., *Professor of Bacteriology, Univeristy of Edinburgh, etc.*, and J. E. MCCARTNEY, M.D., D.Sc., *Director of Research and Pathological Services, London County Council, etc.* Fourth edition. Pp. 504. Edinburgh: E. & S. Livingstone. 1934. Price 12*s.* 6*d.*

That a fourth edition of this small manual on practical bacteriology has been called for within nine years of its first appearance is sufficient evidence of its usefulness. The present edition is divided into three sections: Part I consists of the general biology of micro-organisms and immunity; Part II deals with bacteriological technique, whilst Part III deals with the various pathogenic micro-organisms and diagnosis. The introductory part dealing with the general biology of micro-organisms and immunity is compressed into forty pages, and it will be difficult for the uninitiated to

understand what it is all about. A full understanding of the principles of bacteriology is not so easily acquired. The second part, dealing with bacteriological technique, will serve as a useful guide to laboratory workers, whether engaged in the human or veterinary side of bacteriology. For whilst it is true that bacteriology can only be learnt at the bench, a guide is necessary, and this book may often serve such a purpose when no teacher is at hand. The chapter dealing with the preparation of culture media is especially useful, as particulars of new modifications are given, including the preparation and storage of media in screw-capped bottles, the so-called "canned media." Part III deals briefly with the main points of the various pathogenic organisms, and viruses and protozoa are included in its scope. It is inevitable that in a small book with a wide scope, a didactic attitude is adopted, and equally inevitable that statements are made which may be in some doubt. The value of the book lies in its practical application, and as a guide to the technical side of bacteriology it can be recommended to workers on human or veterinary problems, for the science of bacteriology is similar in both spheres.

Economic Mammalogy. By HENDERSON AND CRAIG. $6\frac{3}{4} \times 10$. Pp. x + 258. London: Baillière, Tindall & Cox. Price 26*s*.

THIS book, written by the curators of the University of Colorado Museum, aims to give an account of what that famous expounder of biologic principles, the late Sir J. Arthur Thomson, used to call the "linkages of life," *viz.*, the inter-relationship between animal and animal, and between animals and man. In the words of the authors themselves, "to bring together and to condense into compact form as much as possible of the information concerning the economic relations of mammals; their bearing upon the welfare of the human race; their food habits; methods of preserving the more useful species and controlling the more harmful; the danger of exterminating certain species; and various other interesting facts pertinent to the subject. . . ." It is thus a study in mammalian ecology. The book is divided into two parts: Part I—General, and Part II—Systematic. The theme of the general discussion is the interdependence of all living things. This is one of the main principles of biology, and time and again it is emphasised that no living creature, nor any set of living creatures, can be regarded as isolated individuals independent of all other forms of life, but that all living organisms are essential parts of an integrated whole. Sections in this part are devoted to an outline of the various ways in which animals affect the economic and social welfare of man. Their relation to disease and their importance as a source of wealth, as well as the economic relations existing between various species of animal, are discussed in an informative but somewhat cursory manner. Part II is devoted to a systematic discussion of the various orders of the class Mammalia. This discussion is non-technical, being written in a language that anybody can understand. The evolutionary history, mode of life and habits, and geographical distribution of all the better-known mammals such as might be found in any zoological gardens are briefly described. There are no illustrations, but the book is excellently printed, and contains a full bibliography of references. For anybody who is interested in the more popular aspects of biology the book will prove interesting reading.

Report of the Veterinary Director-General for Canada for the year ending March 31st, 1933. Ottowa: Published by the Canadian Department of Agriculture.

THIS annual report, by George Hilton V. S. Harcus, states that although foot-and-mouth disease in garbage-fed hogs broke out in U.S.A. on April 29th, 1932, the sound protective measures used in the Dominion kept it out of Canada, and as there have been no extensive outbreaks of scheduled diseases in the country, it has been possible to pay particular attention to the control of bovine tuberculosis. There were five

small outbreaks of hog cholera and one case of rabies in a bull bitten by a rabid dog. Material progress has been made in the control of bovine tuberculosis. The supervised herd plan has resulted in 10,000 new herds being accepted under its provisions. Many experimental herds have been submitted to blood tests for Bang's disease for several years. The tests employed are the slow agglutination, the rapid agglutination, and the complement fixation.

The virulence, pathogenicity and relationship of dog, fox and mink distemper has been investigated. It has not, however, been determined that dog distemper vaccine and serum will satisfactorily immunise against the disease occurring in foxes. Some of the sledge dogs of the Canadian Mounted Police were vaccinated with the Laidlaw-Dunkin products against distemper, and report forms have been left at the police posts to be filled in later. Dr. A. E. Cameron, M.C.V.S., Chief Veterinary Inspector, supplies a very lucid and comprehensive report on the work of the Contagious Diseases Divison, and E. A. Watson, V.S., Chief Animal Pathologist, gives an interesting review of the work of the Pathological Division. His report of the biological studies and vaccination trials of B.C.G. vaccine, continued over a period of eight years, indicate that so far no lasting immunity of cattle has been achieved.

News

EAST HORSLEY'S SPORTING GYMKHANA FOR ROYAL VETERINARY COLLEGE.

War Veteran "Sporty" Helps Giant Nose-Bag 250,000,000 Farthing Fund.

UNDER the presidency of the Marquis of Crewe, the East Horsley Gymkhana Association held a well-organised gymkhana and horse show at East Horsley on Saturday, October 6th, in aid of the Royal Veterinary College. Rain fell throughout the day, and the attendance, therefore, was largely confined to spectators who watched the events cosily from their closed cars encircling the course.

Among the judges were Sir Frederick Hobday, Lieut.-Colonel Knott and Messrs. A. C. Cowley, E. Buckley, S. Boorman, C. W. Howard, T. E. Hopkins, P. Thrale, F. H. Chown, Sam Marsh, E. B. Eyre and A. J. Craft.

Other officials included Mr. C. W. Howard, M.R.C.V.S., and Mr. J. Craft, M.R.C.V.S. (honorary veterinary surgeons); Dr. W. L. Winslow-Smith (hon. medical officer); Mr. G. Bodilly and Mr. H. Legg (ring masters); Mr. Donald F. Chown (hon. sec.); and Messrs. F. H. Chown, W. Hazeltine, D. Norman, E. B. Eyre, N. Howard, R. Norman, T. C. White, and Miss A. Thrale.

All events were announced from *The Daily Mail* loud-speaker van which had been kindly lent for the occasion.

"The World's Largest Nose-Bag," which is being used to collect 250,000,000 farthings for the Royal Veterinary College Hospital, was on *outdoor* exhibition for the first time. The day's collection was formally initiated by the Marquis of Crewe, who dropped a token gift into one of the money-slots of the monster bag suspended on a special frame. Child competitors rode up on their ponies to the nose-bag and dropped in their money; and dogs (with coins in their paws) were held up to contribute. It will be recalled that "The World's Largest Nose-Bag" was "christened" by the Lord Mayor of London at the International Horse Show at Olympia.

Another highly popular effort to help the Royal Veterinary College Hospital Giant Nose-Bag 250,000,000 Farthing Fund at the Gymkhana was made by the Misses M. and B. Machin. During the whole of the afternoon they led round their handsome-

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looking War veteran " Sporty," and collected from the occupants of the motor cars. " Sporty " carried on his chest an Army service nose-bag converted into a collecting bag and bearing his fighting record as follows :

" I was born in Ireland, and am 27 years old.

" In 1914 I was bought by Colonel H. M. Ferrar, C.B.E., for the Royal Regiment of Artillery.

" I served overseas, from 1915 to the end of the War, in France and Flanders.

" I was paraded in great honour — with 23 other War veterans — at the International Horse Show, Olympia, 1934.

" I am the happy pensioner of the Misses M. and B. Machin.

" I hunt regularly with the Surrey Draghounds.

" In 1934 I won the First Prize in the Ladies' Hunter Trials at Chessing Chase against twenty competitors.

" Please put some money—notes, cheques or coins—in *my* nose-bag for the Royal Veterinary College Hospital Giant Nose-Bag 250,000,000 Farthing Fund. . . . Thank you ! "

Sir Frederick Hobday is receiving the most generous support from many other owners of War veteran horses in making similar collections in all parts of the country.

THE CANINE INSURANCE ASSOCIATION, LTD.

The Canine Insurance Association, Ltd., of 57, Gracechurch Street, London, E.C.3, of which Major-General Sir John Moore, K.C.M.G., C.B., F.R.C.V.S., is Chairman, has seriously tackled the rather complex subject of dog insurance, and it is quite obvious from their latest prospectus, namely, Brochure C, that they have made great progress during the last twelve months. The annual dog licence records demonstrate that the number of dogs is again steadily increasing, and what is more important still is the fact that dog lovers are showing themselves to be much more discriminating nowadays. This means, of course that the tendency is for the average dog to be a better specimen, and in consequence the insurable factor is increasingly present. The Canine Insurance Association, Ltd., has built up a form of insurance that is both unique and sound, and apart altogether from the intrinsic value of the animal, in the event of death their comprehensive cover includes such eventualities as : (1) Death by fire, lightning and accident (including transit risks) ; (2) death from disease or sickness (excluding poisoning) ; (3) death from distemper ; (4) death from whelping—(the insurance under these headings is valid following destruction by a veterinary surgeon for humane reasons)—(5) veterinary surgeon's fees in respect of any accident ; (6) recovery of lost or stolen dogs ; (7) loss of forfeited entry fees ; (8) liability for personal injuries and property damage and legal costs, including damage caused to sheep, cows or other animals, poultry, etc., claims and legal costs up to £1,000. With many veterinary surgeons, particularly those resident in large cities and towns, the dog is nowadays an important factor, and they can clearly do their clients good service by recommending the protection of dog insurance in general, and " canine policies " in particular, especially as it is impossible to obtain elsewhere all the benefits that these provide. In inviting veterinary surgeons to become agents, the Association does not, of course, expect them to act as canvassers, but many are the opportunities they have of bringing a very necessary precaution to the notice of dog owners.

R.A.V.C. OLD COMRADES ASSOCIATION.

The Annual General Meeting and Dinner will be held at Anderton's Hotel, Fleet Street, London, E.C.4, on Friday, November 2nd, 1934. Meeting, 6.30 p.m. ; Dinner, 7.30 p.m. Tickets may be obtained from the Hon. Secretary and Treasurer, 106, Marlborough Lane, Charlton, London, S.E.7. Members, 4*s*. ; non-members, 5*s*.

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THREE BREEDS OF SHEEP

BY

R. H. LAMB
W. O. STRIDE
AND
W. J. WOOFF

The Herdwick
The Southdown
The Hampshire Down

VETERINARY JOURNAL SUPPLEMENT
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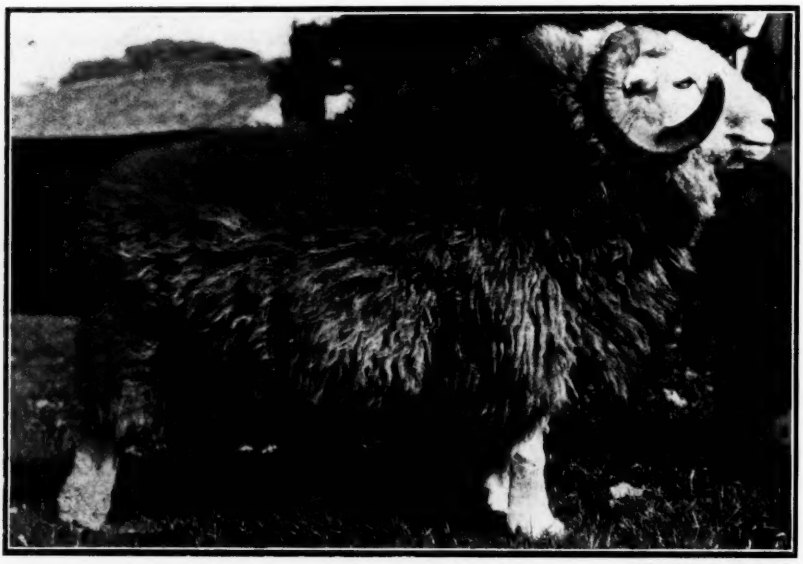
THE HERDWICK

By R. H. LAMB,

Secretary, the Herdwick Sheep Breeders' Association.

PROBABLY the least known of British breeds of sheep, the Herdwick has many claims to attention which in the past have received but scanty recognition. Bred for centuries in the Fell districts of Cumberland, Westmorland, and a small portion of north Lancashire, it still stands supreme for sheer hardiness. Repeated experiments have proved that no other breed of sheep can stand so well the rigors



[*Photo by R. H. Lamb*

A TYPICAL HERDWICK RAM

of the climate of the Lakeland hills, on the bare and rocky grazings of which the Herdwick thrives so well.

Writers with no practical knowledge of the subject repeat each other in saying that all attempts to improve the Herdwick have failed, and that the breed is of a primitive type, and consequently of little use to the average farmer. This is quite wrong, for actually there was considerable improvement following the enclosure of commons, and more recently competition and the establishment of the Herdwick Sheep Breeders' Association have done much towards raising the standard of excellence by promoting selective breeding. The Association has set up a Flock Book, but before any Herdwick may be registered therein it must first pass the test of inspection for individual merit, and also be the offspring of approved sire and dam. It is obvious to any stockbreeder that such a scheme

must in the long run produce a superior type of animal ; and its progress is being watched with interest by many.

The Herdwick is by nature a mountaineer. It is so astonishingly hardy that it will flourish where almost any other breed of sheep would perish. On mountain tops, where grass is coarse and scanty, it will support itself all the year, ignoring storms, and breed lambs and grow wool and mutton of commercial value. Until recently it was thought that the wool could be used for nothing but carpet-making, but now, owing to the enterprise of the Herdwick Association, it has been demonstrated that it can be made into saleable tweed of great durability.

Another great virtue of the Herdwick which is only now gradually becoming known is the excellence of its mutton. Sweet, fine-grained, extremely lean and tender, it is not to be surpassed by that of any other, while in these days of small families it has the additional claim of being small in joint. Like nearly all mountain mutton, however, it must be " hung " some days before being cooked. Although for generations it has been highly esteemed in the dales where it is produced, and visiting epicures unanimously pronounce it unbeatable, practically no attempt has been made to popularise it. Fat Herdwicks are regularly sold every week in the local auction marts, bought by dealers and sunk in a nameless grave in the meat markets of large towns. In recent years I have repeatedly drawn attention to this excellent commodity, for I am strongly of the opinion—and I am not alone here—that organisation in this respect bristles with possibilities. It is, however, satisfactory to notice that the Herdwick has gained more favour with the Low Country farmer. Adaptable and responding readily to better pastures and milder climates, the ewes are excellent for draft purposes, for mating with any of the large white-faced rams, and as a special merit, have great wearing qualities.

All things considered, the one weakness of the Herdwick of to-day is its lack of size. If breeders will aim at the production of a larger-framed sheep, which is quite possible without any loss of hardiness, there can be no doubt that the Herdwick will gain greatly in popularity and add to its utility.

THE SOUTHDOWN SHEEP

By W. O. STRIDE,

Secretary, The Southdown Sheep Society.

SOUTHDOWNS are our oldest breed of Down sheep, and they have been greatly used in the evolution and improvement of other breeds of Down sheep, while there can hardly be a breed upon which they have not been used in crossing to improve the quality of flesh and to obtain early maturing lambs, for half-bred Southdown fat lambs have almost ideally perfect conformation : the body is square set close to the ground, the bone is light, and the leg of mutton is perfect. As a mutton sheep the Southdown is in the very front rank, for no breed can equal it for prime quality ; while as this is the era of the small joint, the breed again scores heavily, and the Southdown sheep weighing eight stone will provide as

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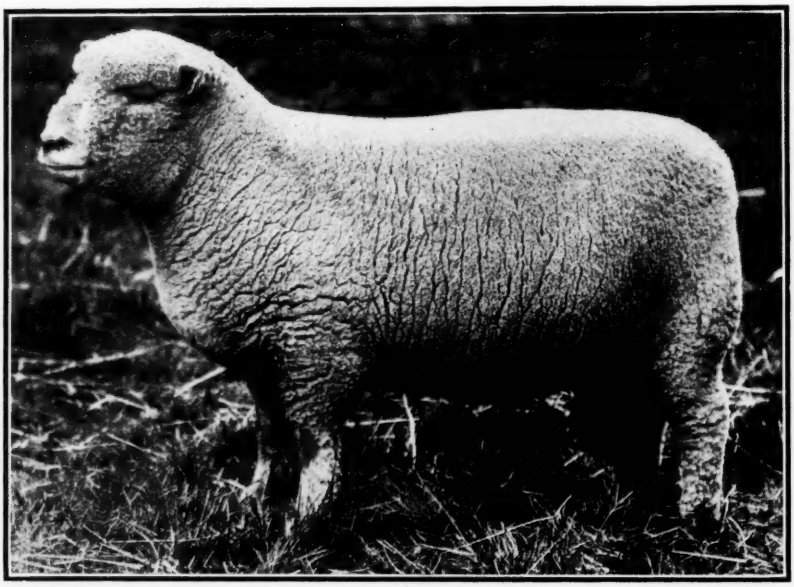
much prime meat as a ten-stone sheep of other breeds, because there is no waste, the bone being small and the flesh fine grained.

Southdowns have proved their value as mutton producers in the highest company, for at the leading fat stock shows they can claim a record that is unique both at home and in the U.S.A. To take the great Smithfield Show, since 1900 Southdowns have gained the supreme Championship in the Live Section on eleven occasions, while in the Carcase Competition their record is even more wonderful, for the championship has now been won thirteen times in all, and ten times since 1918. At the Chicago International Exhibition, since



[*Photo by Sport & General*

SOUTHDOWN SHEARLING RAM

1900 Southdowns or their crosses have won the Single Wether Championship on twenty occasions, the Carcase Championship on twenty-eight occasions, and the Champion Car Lot on seventeen occasions. A very remarkable record.

Southdowns are fairly evenly distributed all over the South of England, in the Midlands, right up to Chester, and in Wales, whilst amongst the new flocks which have been started this year there are two which are as wide apart as Carmarthenshire and Durham. In North and South Wales the breed is extremely popular, and there is an ever-growing demand for rams and ram lambs to mate with the native breeds of the Principality. This is not only owing to the fact that the half-bred Southdown lambs are so esteemed, but also because the breed can withstand extremes of heat and cold and can flourish in any climate.

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As regards prolificacy, the Southdown can hold its own with any breed, and figures collected by the Society have shown that in the large flocks an average taken over many flocks showed a percentage of 126.5 lambs per 100 ewes; while in smaller flocks the average was 124.3 lambs per 100 ewes. As regards cross-breds, figures available show that from 100 Border-Leicester-Cheviot ewes mated with a Southdown ram, a farmer obtained 163 lambs, 80 per cent. of which were sold fat. As regards export, this year has seen a bigger demand than ever for both males and females of the breed, and Southdowns have for many years been exported to most of the sheep-breeding quarters of the globe, and wherever they have gone they have earned golden opinions. In New Zealand they are one of the leading breeds, and the cross of a Southdown ram on a Kent or Romney Marsh ewe, or on an English Leicester ewe, has been the foundation of the Canterbury meat trade. In Australia they are very popular, as in Canada, while South Africa now is coming into the market as a buyer.

Classification for Southdowns is provided at all the leading shows, while the Breed Society holds three recognised shows and sales at Chichester and Bourton-on-the-Water, in Gloucestershire, in August, and at Lewes in September.

HAMPSHIRE DOWN SHEEP

By W. J. WOOFF,

Secretary, The Hampshire Down Sheep Breeders' Association.

THERE are some thirty breeds of sheep now registered in the British Isles, but none of these has made such rapid progress in recent years as the Hampshire Down, a breed which was first established about a century ago in Hampshire, Wiltshire and Dorsetshire.

The real reason so many sheep were kept in this district was that they manured the land for corn-growing. Writing of Wiltshire in 1794, Thomas Davis says: "The first and principal purpose for which sheep are kept in this district is undoubtedly the dung of the sheep-fold, and the second is the wool. The improvement of the carcase was not heretofore thought a primary object, and was perhaps in some degree incompatible with the great object of this district, *viz.*, the hardiness of the animal necessary to enable it to get its food on a close-fed pasture, to walk two or three miles for that food, and to carry its dung the same distance back to fold."

The history of the Hampshire Down is merely a record of careful selection by breeders in Hampshire, Wiltshire, Dorsetshire and Berkshire, and many of the leading breeders of that time bore names which are still respected wherever Hampshire Down sheep are known, and by the interchange of rams the various types of the Hampshire Down sheep were welded into one homogeneous breed, while the Hampshire Down Sheep Breeders' Association was founded in 1890 to look after its interest. During all this time breeders had three main objects in view, and these were early maturity, rapid growth and hardihood. How well they succeeded must be admitted by anyone who studies the records of the modern Hampshire Down.

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A well-bred Hampshire lamb on good keep will increase in weight at the rate of $\frac{3}{4}$ lb. per day from birth, and will weigh 112 lb. by May 31st. If 60 per cent. of this is carcase weight, such a lamb will weigh 68 lb., or 17 lb. per quarter; a heavy weight, but one which is realised without difficulty. Again, the fact that Hampshire ram lambs are fit to use as sires in July, when they are often heavier than the ewes that they serve, is sufficient proof of their rapid growth. It is general ability of Hampshire lambs to produce heavy weights in July and August, when no other breed makes such a fine price in the London market, that

HAMPSHIRE DOWN

is the source of their strength and which places them above all other breeds for early maturity.

So much for early maturity and rapid growth, but these are not the only qualities which commend the Hampshire Down to the practical farmer. Of at least equal importance is the hardihood of the breed. It is capable of standing all vicissitudes of climate, from many degrees below zero to almost tropical heat, and it thrives from the Rocky Mountains to Peru; from the North of Scotland to the South Coast. Flocks of 200 tegs are frequently brought through the winter without a single loss, and deaths seldom occur except at the critical period of lambing. The ewes last well too, and although it is customary to sell them out as regular draft at four and a-half years old—when they are bought by other farmers to breed from again—every good flock contains special ewes of from six

to eight years old, and many favourite ewes have been kept and bred from till they are fourteen years.

But however strong a sheep is, and however quickly it may grow, it is not worth keeping unless its mutton is saleable at the end. Here again the Hampshire Down excels. A Canadian breeder recently explained why he kept Hampshire Downs. He visited Smithfield Market and asked for the stall that handled the best mutton trade in London, and the proprietor of that stall told him that he handled nothing by Hampshire Downs. Again, we have it on the authority of a well-known Smithfield mutton distributing firm, that nothing makes a finer price on the London market than Hampshire Down mutton, especially during July and August. A Hampshire Down is always a shapely and readily saleable sheep, and does not run to fat like so many other breeds.

The fleece of a Hampshire Down is compact and of medium length, and is set closely in the skin. Tegs clip 10 to 12 lb. (average) of unwashed wool, and ewes average 6 to 7 lb.

Hampshire Down breeders were hard hit by the regulations issued during the War, when the price of lamb was controlled at practically the same figure as that of old ewe mutton. Consequently many flocks were given up in favour of cross-breds. It is worthy of notice, however, that farmers in Wiltshire and Hampshire are returning to the Hampshire Down in ever-increasing numbers. One of the largest farmers in Wiltshire, who went in for cross-breds to a very large extent, and can, therefore, speak with great experience, writes as follows : " Undoubtedly Hampshire Downs beat the cross-breds for arable land, as the manure is essential to corn-growing. The lambs come to maturity earlier, and although more expensive to obtain, the revenue is correspondingly greater." In Scotland and the North of England, Hampshire Down rams are used in greater numbers every year, and farmers in other parts of the country—particularly in Devon and Cornwall—are waking up to the fact that the Hampshire Down ram is the ideal sheep for improving the quality and speeding up the growth of the coarser long-woolled breeds.

The same state of affairs is found in other parts of the world. A large U.S.A. breeder writes that in the North-West Rocky Mountain States, Hampshire Downs have practically eliminated competition from other Down breeds. At the last great ram sales at Salt Lake City, Utah, 700 of the Down rams sold were Hampshires, as compared to twenty-eight of other breeds. There is a great demand for export of Hampshire Downs, and they flourish on the foothills of the Rockies (America and Canada), the Argentine, Chile and Peru, as well as Germany, Russia and France.

Finally, although the Hampshire Down has been bred between hurdles for a century, and is especially adapted to stand close folding and heavy feeding, it has proved equally valuable as a grazing sheep, and as a U.S.A. breeder says : " Under the conditions in which these sheep are raised in the North-West, many of them never even see a fence or enclosure of any kind until loaded to go to market." For quality, early maturity and hardiness, and the ability to transmit these characteristics to its progeny, there is no breed to equal the Hampshire Down Sheep.

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